

ISSN 2183-8992

PUBLIC POLICY PORTUGUESE JOURNAL

Volume 6, Number 2, 2021

**Special Issue: Multiple policy entries for a sustainable food
system in Portugal: overview, challenges and solutions**

Editor

Paulo Neto

Guest Editor

Cecília Delgado



UNIVERSIDADE
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Public Policy Portuguese Journal

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Cover Design

Cristina Brázio, Universidade de Évora

Typesetting

UMPP, Universidade de Évora

Publication Information

Public Policy Portuguese Journal is published online by Universidade de Évora and UMPP - Unidade de Monitorização de Políticas Públicas / Public Policy Monitoring Unit, Largo dos Colegiais, 2, 7000-803 Évora, Portugal.

Manuscripts are invited for publication

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ISSN 2183-8992

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Public Policy Portuguese Journal

Volume 6, Number 2, 2021

CONTENTS

Editorial	7
<i>Cecília Delgado</i>	
Foreword	13
<i>Andreas Kraemer</i>	
Food Waste in Portugal: Prioritising Prevention	15
<i>Ekaterina Solomina</i>	
Equality in the access to sustainably produced food: a way to foster local vegetable sustainable production	34
<i>Lia Catarina Frutuoso Cavaleiro</i>	
How to promote sustainable seafood consumption in Portugal? An overview with campaigns as a starting point	56
<i>Maria Inês Trigo</i>	
Shaping Portuguese choices towards more diverse, sustainable and local seafood consumption habits	77
<i>Ana Matias</i>	
The elephant-seal in the room: why and how to regulate marine genetic resources in Portugal	95
<i>Raquel Gaião Silva</i>	
Challenges in managing migratory species' fisheries: the role of stakeholders' engagement	114
<i>Cláudia da Silva Correia</i>	
Produzir alimentos biológicos e locais para abastecer as cantinas escolares: opções políticas de acesso à terra	132
<i>Cecília Delgado</i>	
The root of the matter – ensuring the sustainable use of agricultural soil	154
<i>Ana Marta Paz</i>	

Food Production Vis-à-Vis Water Scarcity in Portugal – Using public policies to promote rainfed nut production	169
<i>Ricardo Próspero</i> <i>Tiago Domingos</i>	
A insegurança hídrica na agricultura - Como garantir abastecimento de água para ter regadio no futuro? Um caminho para a sustentabilidade	186
<i>Carina Arranja</i>	
What is the best policy to reduce the ‘un’sustainable use of pesticides in Portugal	209
<i>Cristina Amaro da Costa</i> <i>José Manuel Lima Santos</i>	

Editorial

MULTIPLE ENTRY POINTS TO STRENGTHEN THE PORTUGUESE FOOD SYSTEM: CONTRIBUTIONS FROM A PUBLIC POLICY PERSPECTIVE

The Public Policy Portuguese Journal, Volume 6, Number 2, 2021, is dedicated to the Policy Studies developed under the LEAP - Policy Development Initiative, a Calouste Gulbenkian Foundation program¹, in collaboration with the International Centre for Policy Advocacy² and the IES - Social Business School³. The program ran from October 2019 to July 2020.

The Calouste Gulbenkian Foundation's initiative aimed to strengthen the capacities of a group of researchers and professionals, from non-governmental organisations, academia, and public administration, for the formulation of public policy recommendations. The initiative falls under Sustainable Development Goal 16: Peace, Justice and Effective Institutions, focusing on sustainable production and consumption, and, in particular on food and agriculture.

Unfortunately, COVID-19 imposed other institutional priorities and what was to be the first edition of a long-term capacity building project became a one and only edition.

The set of 11 articles contained in this volume, which are briefly presented hereafter, clearly illustrate some of the potential multiple entry points that need to be addressed to strengthen the current Portuguese food systems.

At the same time, these articles taken as a whole bring multiple evidence of the relevance of a multi-actor and multi-sectoral perspective for policy formulation. I will return to this topic later.

Defining an entry point per se is a complex, but useful exercise to highlight the interdisciplinary approach that is needed for addressing holistic topics such as food and agriculture.

The papers included in this volume focus on the following areas: food waste; healthy eating; (fish) consumption; governance; access to land; soil; water; production systems; and pesticides.

From the perspective of food waste reduction **Ekaterina Solomina** brings solutions addressing the institutional inability to redistribute surpluses. In particular, those from the cold chain such as unprocessed meat, as its significant ecological footprint reinforces the need to unfold the debate. A decentralised approach is proposed, in parallel with strengthening the powers of the National Commission.

In the context of healthy eating, **Lia Catarina Frutuoso** focuses on the gaps between the various existing policies, in particular the ones regarding vulnerable population. Emphasis is placed on the need to promote a sustainable transition that considers in priority the production of fruit and vegetables, to be delivered in baskets [boxes] to vulnerable social groups.

The study presented by **Maria Inês Trigo**, on fish consumption, addresses the need to change preferences, given the ecological, economic and health consequences of the current pattern. The study focuses on the analysis of the last 10 years consumer's campaigns. She recommends measures to improve the campaigns by engaging all actors in the fish value chain.

In the second study also dedicated to fish consumption, **Ana Matias** points out the need for more diversification of the fish species consumed, aiming for more local and sustainable fishing. Among other recommendations she points out the need to include specific measures on sustainable public procurement related to fish, that should be included in the upcoming revision of the National Green Public Procurement Strategy 2020.

Raquel Gaião Silva discusses the legal uncertainty regarding the rules for accessing the genetic resources on the Portuguese coast and the mechanisms to regulate such access. In order to improve the governance of the existing online platform, a stakeholder survey on the satisfaction and efficiency of this platform is suggested. Such measures should be followed by a pilot project incorporating the proposed improvements.

¹ <https://gulbenkian.pt/project/politicas-publicas/> (Accessed July 2020).

² <https://www.icpolicyadvocacy.org/> (Accessed July 2020).

³ <https://www.ies-sbs.org/pt/> (Accessed July 2020).

The study presented by **Cláudia Correia** falls as well within the scope of governance and addresses the lack of recognition and active participation of fishing communities in management and decision-making processes. A local facilitator to improve communication with different relevant actors and to increase the empowerment of the fishing community is recommended.

The missing links between territorial planning, access to land and food supply are addressed by **Cecília Delgado**. Her contribution provides answers to a specific municipal demand, i.e., how to supply public school canteens with local and organic products. A multi-stakeholder approach is proposed, and a more proactive leadership by local authorities in relation to land access process is advocated for.

Ana Marta Paz reflects on the unsustainable use of land. To do so, she analyses a set of national policies, reflecting on their targets and indicators, as well as their contribution to sustainable agricultural land use. In parallel she relies on two case studies where she explores farmers' recommendations. The creation of a National Strategy for Agriculture, integrating the recommendations and distinct target policies observed, is proposed.

Ricardo Próspero and **Tiago Domingos** discuss the environmental impacts of intensive production systems such as for nuts production, which leads to high water consumption, loss of natural habitats and biodiversity. A set of public policies is recommended to foster non-irrigated production, and the use of alternative ways of retaining and managing water.

The unsustainability of the current water supply is discussed as well by **Carina Arranja**. A broad debate among stakeholders is recommended, within the formulation of a new policy. This agenda should consider the need to ensure water security in agriculture, stop agricultural abandonment trend, and meet food security imperatives.

Cristina Amaro da Costa and **José Manuel Lima Santos** introduce the issue of unsustainable pesticides use. They propose a policy based on the application of a toxicity-indexed tax, that reflects the additional environmental and health costs of pesticide use and compensates the related negative impact.

The multi-stakeholder and multi-sectoral perspective relevance are highlighted by the authors' diverse academic and professional backgrounds, which vary from: non-governmental organisations, five authors; public administration, two authors; and finally, the academia represented by eight authors. At the same time this variety brings out, in an innovative way, the need for a major involvement of all actors and sectors along the food chain. The recommendations made by Maria Inês Trigo; Raquel Gaião Silva; Cláudia Correia, Cecília Delgado and Carina Arranja are quite illustrative of that specific issue.

I shall mention that this publication is, as well, a legacy, of the meritorious work carried out by authors and trainers within the scope of the LEAP - Policy Development Initiative project. Hopefully, this publication will be a fruitful and inspiring driver to improve those public policies that shape Portuguese food systems.

However, this work cannot stop here! The multiple challenges of the Sustainable Development Goals, namely N.º 16 - "Peace, Justice and Effective Institutions" and N.º 12 - "Sustainable Production and Consumption", which are at the core of these 11 articles, justify that the involvement of non-governmental organisations, the academy and the public administration needs to remain on top of the political decision-making agenda.

In the short term, a challenge remains: to put into practice the 11 public policies proposed herein!

August 2021

Guest Editor

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We extend our gratitude as well to the scientific reviewers, who through their comments and suggestions have strengthened the scientific quality of the 11 articles published in this issue:

Adriano Pimpão - Universidade do Algarve, Portugal | Ana Alvares Ribeiro Marques de Aguiar - GreenUPorto & DGAOT, Faculdade de Ciências da Universidade do Porto Porto. Campus de Vairão, Portugal | Artur Cristóvão - Universidade de Trás-os-Montes e Alto Douro, Centro de Estudos Transdisciplinares para o Desenvolvimento | Catarina Grilo - ANP|WWF - Associação Natureza Portugal | Cheila Almeida – IPMA – Instituto Português do Mar e da Atmosfera, Portugal | Elisabete Figueiredo - Linking Landscape, Environment, Agriculture and Food (LEAF), Instituto Superior de Agronomia, Universidade de Lisboa, Portugal | Gabriel Osório de Barros - Gabinete de Estratégia e Estudos da Área Governativa da Economia e Transição Digital, Portugal | Gonçalo Caleia Rodrigues - LEAF - Linking Landscape, Environment, Agriculture And Food, Instituto Superior de Agronomia, Universidade de Lisboa, Portugal | João Ferrão - Instituto de Ciências Sociais, Universidade de Lisboa, Portugal | John Edwards | Jorge Ramos - CinTurs - Research Centre for Tourism, Sustainability and Well-being | Faculdade de Economia, University of Algarve, Portugal | José R. Pires Manso - Universidade da Beira Interior, Covilhã, Portugal | Manuela Moreira da Silva - Instituto Superior de Engenharia. Centro de Investigação Marinha e Ambiental (CIMA); Centro de Engenharia e Desenvolvimento (CEiiA), Universidade do Algarve, Portugal | Maria Manuela Santos Natário - Unidade de Investigação para o Desenvolvimento do Interior, Instituto Politécnico da Guarda (UDI/IPG), Portugal | Rosário Oliveira - Instituto de Ciências Sociais - Universidade de Lisboa, Portugal | Sofia Guedes Vaz - IFILNOVA / FCSH / Universidade Nova de Lisboa, Portugal.

Editorial

DISTINTOS PONTOS DE ENTRADA PARA REFORÇAR O SISTEMA ALIMENTAR PORTUGUÊS: CONTRIBUTOS NUMA PERSPETIVA DE POLÍTICAS PÚBLICAS

O *Public Policy Portuguese Journal*, Volume 6, Number 2, 2021, é dedicado aos Policy Studies desenvolvidos no âmbito do programa LEAP – *Policy Development Initiative*, um projeto da Fundação Calouste Gulbenkian⁴ em colaboração com o Internacional Centre for Policy Advocacy⁵ e o IES – Social Business School⁶. O programa decorreu de Outubro de 2019 a Julho de 2020.

A iniciativa da Fundação Calouste Gulbenkian teve como objetivo capacitar para a elaboração de recomendações de políticas públicas, um conjunto de investigadores e colaboradores, de organizações não-governamentais, da academia e da administração pública. A iniciativa enquadrou-se no Objetivo de Desenvolvimento Sustentável n.º 16. Paz, Justiça e Instituições Eficazes, focando-se na produção e consumo sustentáveis, em particular nos temas da alimentação e agricultura.

Infelizmente o COVID-19 ditou outras prioridades institucionais e aquela que seria a 1.ª edição de um projeto de capacitação a longo prazo ficou-se por uma edição isolada.

O conjunto de 11 artigos contidos neste volume, e que se apresentam brevemente de seguida, ilustra de forma inequívoca alguns dos potenciais múltiplos pontos de entrada do sistema alimentar que urge intervir no contexto do atual sistema alimentar português.

Simultaneamente, este conjunto testemunha a importância de uma perspetiva multiatores e multisectorial na formulação das políticas. Voltaremos a este tema.

Definir *per se* um ponto de entrada é um exercício complexo, mas relevante, para evidenciar a interdisciplinaridade que é necessária, em temáticas holísticas como a alimentação e a agricultura.

Os estudos que compõem este volume debruçam-se, particularmente, sobre as seguintes temáticas: desperdício alimentar; alimentação saudável; consumo (de pescado); governança; acesso à terra; solo; água; sistemas de produção e por fim os pesticidas.

Na ótica da redução do desperdício alimentar **Ekaterina Solomina** procura apresentar soluções para a incapacidade das instituições redistribuírem excedentes. Especialmente os provenientes da cadeia de frio tais como a carne não processada, cuja pegada ecológica significativa reforça a pertinência do debate. Propõe-se uma abordagem descentralizada em simultâneo com o reforço dos poderes da Comissão Nacional.

No âmbito da alimentação saudável, **Lia Catarina Frutuoso** foca-se no desalinhamento das políticas existentes, centradas essencialmente na resposta à população carenciada. Reforça-se a necessidade de promover uma transição sustentável que considere, nomeadamente, a produção de frutas e hortícolas para fornecimento dos cabazes de apoio à população carenciada.

O estudo apresentado por **Maria Inês Trigo**, relativo ao consumo do pescado aborda a necessidade de mudar as preferências de consumo do pescado em Portugal, dadas as consequências ecológicas, económicas e para a saúde do atual padrão. O estudo foca-se na análise das campanhas de consumo dos últimos 10 anos. Recomendam-se medidas para melhoria das campanhas envolvendo todos os atores da cadeia de valor.

No segundo estudo dedicado igualmente ao consumo de pescado, **Ana Matias**, aponta a necessidade de maior diversificação das espécies de pescado consumidas, numa ótica de mais pesca local e sustentável. Entre outras recomendações aponta-se para a necessidade de inclusão de disposições sobre as públicas sustentáveis de pescado na revisão da Estratégia Nacional de Compras Públicas Ecológicas 2020.

Raquel Gaião Silva discute a incerteza legal relativa às regras de acesso e mecanismos de regulação dos recursos genéticos da costa portuguesa. Numa perspetiva de melhorar a governança da plataforma online existente, sugere-se uma audição dos *stakeholders* sobre a satisfação e eficiência da dita plataforma. Seguindo-se um projeto piloto que incorpore as melhorias propostas.

⁴ <https://gulbenkian.pt/project/politicas-publicas/> (Acedido em Julho 2020).

⁵ <https://www.icpolicyadvocacy.org/> (Acedido em Julho 2020).

⁶ <https://www.ies-sbs.org/pt/> (Acedido em Julho 2020).

O estudo apresentado por **Cláudia Correia** insere-se igualmente na governança tendo como problemática a falta de reconhecimento e participação ativa das comunidades piscatórias nos processos de gestão e decisão. Recomenda-se um agente local capaz de facilitar a comunicação e capacitação da comunidade piscatória.

A falta de ligações entre o ordenamento do território, o acesso à terra e o abastecimento alimentar é debatido por **Cecília Delgado**. A problemática responde a uma necessidade específica de um município que pretende abastecer com produtos locais e biológicos as cantinas escolares públicas. Propõem-se uma abordagem multiatores e recomenda-se um papel mais proactivo das autarquias locais como mediadoras no processo de acesso à terra.

Ana Marta Paz reflete sobre o uso insustentável do solo. Para o fazer analisa um conjunto de políticas nacionais, refletindo sobre as suas metas e indicadores, e o contributo destas para o uso sustentável do solo agrícola. Paralelamente suporta-se em dois estudos de caso onde analisa as recomendações dos agricultores. Recomenda-se a criação de uma Estratégia Nacional para a Agricultura, numa ótica integrativa das recomendações e diferentes metas observadas.

Ricardo Próspero e Tiago Domingos refletem sobre os impactos ambientais do sistema de produção intensiva frequentemente utilizados na produção de frutos secos, o que acarreta elevado consumo de água, a perda de habitats e biodiversidade. Recomenda-se um conjunto de políticas públicas de incentivo à produção em modo de sequeiro, e recurso a modos alternativos de retenção e utilização de água.

A insustentabilidade do atual abastecimento de água é debatida igualmente por **Carina Arranja**. Recomenda-se um debate alargado entre atores para a conceção de uma nova agenda política para o regadio. Essa agenda deve refletir a necessidade de se garantir a segurança hídrica na agricultura, travar a tendência de abandono agrícola, e garantir a segurança alimentar.

Cristina Amaro da Costa e José Manuel Lima Santos introduzem a temática do uso insustentável dos pesticidas. Propõem uma política baseada na aplicação de uma taxa indexada à sua toxicidade, que reflita os custos marginais do uso de pesticidas no ambiente e na saúde, e que compense as externalidades associadas ao uso de pesticidas.

A relevância de uma perspetiva multiatores e multisectorial é evidente nas diferentes formações académicas dos autores destes estudos, bem como nos seus enquadramentos profissionais, que variam entre: as organizações não-governamentais, cinco autores; administração pública, dois autores; e por fim a academia representada por oito autores. Simultaneamente os artigos referem de forma inovadora, a importância da participação ativa de todos os atores e sectores ao longo da cadeia alimentar. Vejam-se a título de exemplo as recomendações apontadas por: Maria Inês Trigo; Raquel Gaião Silva; Cláudia Correia, Cecília Delgado e Carina Arranja.

Termino referindo que esta publicação é o legado possível ao meritório trabalho desenvolvido pelos autores e formadores no âmbito do projeto LEAP – *Policy Development Initiative*. Espera-se que seja uma alavanca frutuosa e inspiradora para melhorar as políticas públicas que configuram os sistemas alimentares em Portugal.

Mas o trabalho não pode parar! Os múltiplos desafios dos Objetivos de Desenvolvimento Sustentável, nomeadamente o n.º 16 – “Paz, Justiça e Instituições Eficazes” e o n.º 12 – “Produção e Consumo Sustentável”, que constituem a génese destes 11 artigos, justificam que o investimento e envolvimento das organizações não-governamentais, da academia, e da administração pública, permaneça no topo da agenda política de decisão.

No imediato, fica o repto da materialização no território das 11 políticas públicas aqui propostas!

Agosto 2021

Editora Convidada

Cecília Delgado

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Centro Interdisciplinar de Ciências Sociais da UNL

Queremos ainda agradecer o generoso contributo dos revisores científicos, que através dos seus comentários e sugestões robusteceram a qualidade científica dos 11 artigos que fazem parte desta edição:

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Foreword

FOOD FOR POLITICAL THOUGHT: DEMOCRACY, DECISION-MAKING ON COMPLEX ISSUES, AND INSTITUTIONS OF EXPERTISE

What makes a good democracy and good statecraft? Regular and orderly, free and fair elections, leading to peaceful changes of government? Effective and attractive political parties that represent a wide range of values views and interests? An election turn-out of 75% or more? Protections for minorities in parliament and society? A free press and vibrant media picking up stories of public interest that drive public discussion? A constructive political culture that allows good policies and laws to be developed, enacted and enforced in fairness and with good effect? Most of us would answer all these in the positive, and we would still miss important aspects.

In a democracy, policy-making is a spectator sport, a public contestation of ideas, arguments, data and assumptions, and policy proposals as they are being developed. Sometimes it is highly visible on television and driven very strongly by personalities and populist, sometimes it is driven by evidence and technocratic analysis and only policy experts pay attention. Policy-making can be invisible, so much so that we might not notice if there is no policy being made at all. Most of the time policy-making is somewhere in between these extremes, and ideally all decisions and laws are based on good analysis of reliable evidence and the strong commitment by all to follow through with action to give effect to the decision or law.

The legitimacy of democracy relies, *inter alia*, on two pillars: First, the effective and influential participation of the people in making the rules by which they live together with their elected representative holding temporary office in parliament or government. And second, the good outcomes of public policy-making which – by virtue of its openness and inclusiveness of the process – tend to be better and have fewer serious mistakes than in other political systems. Those two pillars of legitimacy create acceptance of policy outcomes even by those who were opposed: Their voices were heard, their views considered, and their interests balanced with those of others in the process.

However, the greatest part of inhabitants, citizens, and voters in any country does not have the time, the inclination, or the training that is needed to participate in policy formulation. For this they would need to access, process, analyse and visualize the mass of data available, even if they are presented on an easy-to-use platform like in Pordata (which Portugal is lucky to have).

That is why, in a democracy, we not only have elected legislators and government, but also expert journalists, specialists in political parties, academic institutions, and policy institutes or "Think Tanks". They all contribute to a knowledge-based, and data driven evaluation, assessment and ultimately contestation of policy ideas and legislative proposals. Democracy needs these institutions and the policy experts working within them in order to function: Democracy is a market place of ideas, and it needs sellers, buyers, brokers, and a public system of quality control. Weak or bad policies should be found out and corrected, and gaps in policy-making should be identified through "policy entrepreneurs" looking for niches to fill.

Covid-19 has revealed that there was not enough policy to prepare for a pandemic, despite the warnings we had with the SARS pandemic in 2002 and 2003 and other emerging viruses like MERS. I would argue that food and nutrition were – and still are – so invisible in Portugal that the lack of policy was generally not noticed before the publication of this journal issue. Shedding light on this underdeveloped policy area was a great achievement of the LEAP Programme of the Gulbenkian Foundation.

LEAP, in which I was a mentor to three of the fellows, combined all the good elements of what evidence-based policy advocates or "think tankers" need: Access to reliable data, good analysis, evaluation and assessment, a combination of scientific disciplines and methods that are suited to solving the challenges identified, a focus on finding solutions in exchange with colleagues who question, contest, correct or validate every step in the process, and a willingness and ability to formulate concrete options and recommendations for public policy or business decisions. Going beyond scientific excellence in multidisciplinary research and analysis and, in addition, striving for policy relevance and timeliness is not something that is learned at university. LEAP filled a gap.

Looking at Portugal from the outside, one observes a lack of strong policy institutes or "think tank" that work at the interfaces of science, society, and policy-making. There is even confusion about the term "think tank", which in Portuguese can be a small, ad-hoc and temporary group of usually male

and senior experts discussing an issue in a format that would be called a workshop or a short series of workshops in English. “Think Tanks”, in English, denotes a durable institution with legal personality that produces science-based policy-relevant information and translates science into policy as well as policy challenges and ideas into questions that can be addressed by the sciences.

In general, the think tanks in Portugal are weak institutions, with small numbers of staff and small budgets, often embedded in universities where they may contribute to science but, because of the reward system and career paths in academia, cannot easily maintain policy relevance. Often a “think tank” is not much more than a web site maintained by a group of individuals and not an institution. Some of the web sites have not been maintained for some years, so some of the think tanks may no longer exist. Furthermore, Portuguese think tanks are absent from international networks and thus do not represent Portuguese perspectives where they should, in Brussels, in Washington, in international forums and conferences, and in the global community of think tanks.

A recent analysis “Impacto Social das Fundações Portuguesas” by the Centro Português de Fundações revealed that no-one knows how many foundations there are because there is no reliable register of them, that some of those on lists may no longer be active, or not really be foundations as not-for-profit organisations that work for the public interest. The authors at the Católica Porto Business School of the Universidade Católica Portuguesa also conclude that foundations are important employers but have a disturbing lack of transparency on funding sources and use of funds. That lack of transparency damages the credibility and reputation of foundations.

Everything that the report says about foundations applies, one suspects, also to think tanks. There is a need to take stock and make a list, for all of them to become more transparent, for the legal and regulatory framework to be updated and aligned with good practices in EU countries. Once the sector is strengthened and reformed, once the public interest they serve is more visible and better understood, more public and private funding is bound to flow into it. That should provide more opportunities for LEAP fellows to pursue their work of bringing science-based evidence into policy discourse and help to strengthen democracy.

August 2021

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Food Waste in Portugal: Prioritising Prevention

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ABSTRACT

The study concentrates on assessing the food waste reduction efforts in Portugal to determine their reach and the need for a possible adjustment. Official data on food waste is to be published in 2023, in the meantime, the civil society, the business sector and the government have been developing and implementing measures aimed at waste reduction. Distribution of surplus food through the social solidarity mechanisms arose as the predominant type of intervention nationally; comparatively, prevention initiatives with higher environmental benefits have a lower weight among food waste reduction responses. The study reviews international practice and analyses two approaches to adjusting the country's response to the food waste challenge. Globally, there are two general types of responses: the 'centralised' approach with stronger regulation and control; and the 'decentralised' — already to some extent implemented in Portugal — aimed at raising awareness of lacunas in the current practice and promoting response by the business sector and the social economy. The study provides recommendations to enhance the economic, social and environmental benefit, using the mechanisms built into the decentralised approach that organically crystallised in Portugal, to refocus response on prevention and on innovative solutions to distribute the surplus food currently excluded from the charitable food distribution.

Keywords: Food waste, responsible consumption, sustainable development, sustainability.

JEL classification: Q01.

RESUMO

O presente estudo concentra-se na avaliação das medidas relacionadas com a redução do desperdício alimentar em Portugal para determinar o seu alcance e a necessidade de eventual ajustamento. Os dados oficiais sobre o desperdício alimentar deverão ser publicados em 2023, entretanto a sociedade civil, as empresas e todos os níveis de governo têm vindo a desenvolver medidas visando a redução do desperdício. A distribuição de excedentes alimentares através de mecanismos de solidariedade social surgiu como a forma de intervenção predominante a nível nacional; iniciativas de prevenção com os maiores benefícios ambientais têm um peso menor entre as respostas atuais. O estudo analisa a prática internacional e as duas abordagens possíveis ao desafio do desperdício alimentar. A nível global existem dois modos de dar resposta ao problema: a abordagem 'centralizada' com uma regulação e supervisão mais robustas; e a 'descentralizada' — já em certa medida implementada em Portugal — com o intuito de sensibilizar para as lacunas da prática atual e incentivar uma resposta adequada por parte dos sector empresarial e economia social. O estudo fornece recomendações detalhadas que permitiriam obter os mais elevados benefícios económicos, sociais e ambientais, utilizando os mecanismos integrados na abordagem descentralizada que se cristalizou organicamente em Portugal para reorientar a resposta na prevenção e em abordagens inovadoras para distribuir os excedentes alimentares atualmente excluídos do circuito de distribuição de alimentos excedentes para caridade.

Palavras-chave: Desperdício alimentar, consumo responsável, desenvolvimento sustentável, sustentabilidade.

Classificação JEL: Q01.

1. INTRODUCTION

Despite going through tough economic times recently and heavily relying on imported food, Portugal wastes considerable amounts of food annually. For instance, meat, a very resource intensive product, is wasted at approximately 12% (Batista P., Campos I., Pires I. and Vaz. S., 2012), while globally this commodity is wasted at the rate of 5% according to the Food and Agriculture Organisation of the UN (FAO, n.d.a). To contextualise the current level of waste: according to the FAO data, Portugal holds the 12th place globally in terms of meat availability (Our World in Data, 2019), or, each resident of Portugal has almost 2,5 times more meat available for consumption than the global average, that is, the country is facing a double challenge of unsustainable consumption and considerable food waste.

The Portuguese government is aware of this challenge and works on meeting its commitment to achieve Sustainable Development Goal 12, 'Ensure Sustainable Consumption and Production Patterns', more specifically, Indicator 12.3 'By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest'. A dedicated national commission (Comissão Nacional de Combate ao Desperdício Alimentar, hereinafter, the CNCDA) was established within the structure of the Ministry of Agriculture, implementing a relatively recent National Strategy and Action Plan (CNCDA, 2017). One of CNCDA's strong features is its convening power to include a variety of ministries and agencies, industry associations and civil society actors to provide input on the relevant facets of the food waste problem. It is also able to pool technical expertise to support the ongoing food waste reduction initiatives.

There is currently no official data on food waste in Portugal. The country is due to report its food waste quantification data to the EU in mid-2022 (European Commission, 2018). The rate for meat waste cited above is a result of the 2012 study (Baptista et al.) that provides good indications of the food waste along the production and consumption chain and, as of completion of this study in 2020, continues to serve as the benchmark for food waste by commodity along with an additional overview of the issue by Pires (2018). There have been no comprehensive studies of the current food waste reduction practice to date, there are, however, multiple country wide and local initiatives taken forward by the civil society in cooperation with the business sector.

In order to provide a meaningful way forward before the official data is available, it is necessary to assess the nature and impact of the ongoing food waste reduction initiatives. A useful tool to map such initiatives is contained in the European Commission documents (the EU Waste Hierarchy discussed in detail below), whereby the Commission clearly attaches greater value to prevention in terms of resource efficiency; while disposal is viewed as the least preferable option. Assignment of food waste management initiatives according to various levels of the waste hierarchy provides a proxy for their relative impact and highlights possible gaps in their reach in terms of specific commodities and parts of the production and consumption chain that are currently underserved or excluded from the ongoing efforts. Understanding the distribution and scope of such initiatives, even in the absence of official statistics, would permit adjustment of the current practice towards a more resource-efficient and equitable way of dealing with the food waste problem in Portugal.

Given the above, the current study assesses the current practice in order to determine possible lacunas and/or oversaturation of specific types of interventions for a possible adjustment of the ongoing implementation of the National Food Waste Reduction Strategy and Action Plan. Relying on the EU Waste Hierarchy, the study employs a variety of methods, including a review of legislation and regulation, the available statistical data, semi-structured interviews with practitioners and exploratory expert interviews (Bogner, 2009) to contextualise the existing policy and practice.

In order to determine possible lacunas in the food waste management, the study will first consider the terminological ambiguity of the food waste concept, then, it will dwell on the specificities of the Portuguese food waste policy and practice. To gain a better understanding of the food waste locally, a commodity specific case study is undertaken focusing on meat, as an animal protein with high resource intensity and caloric value (World Resources Institute, 2016). The study will then proceed to review available policy options informed by the existing international best practice to pinpoint

interventions that appear most promising in the Portuguese context, followed by a list of specific recommendations as to how such changes may be implemented.

2. FOOD WASTE REDUCTION IN ABSENCE OF THE OFFICIAL DATA

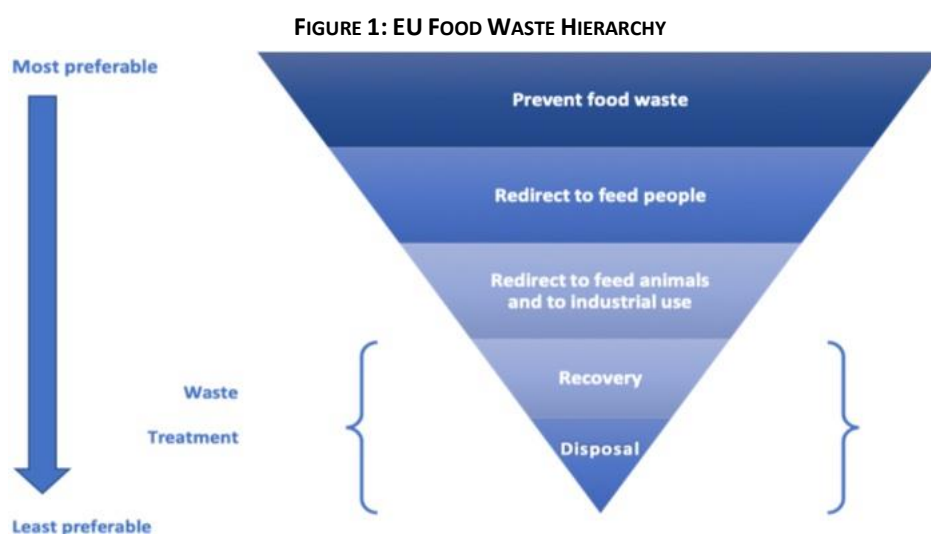
Policy and practice of fighting against food waste in Portugal are discussed below, starting with a brief outline of the global agenda and approaches to food waste reduction, then, alongside a closer look on the Portuguese context, data and interventions, the meat case study is explored, followed by a review of policy and practice failures and opportunities.

2.1. Food Waste Globally: Terminology and Practice

The current study follows international resolutions and commitments and treats as unproblematic the overarching need to reduce food waste due to its environmental, economic and social impacts. The UN included food waste as a separate indicator in the Sustainable Development Goal 12 (FAO, n.d.b), while the earlier Millennium Development Goals implied the necessity to reduce food waste in Goal 1: Eradicate extreme poverty and hunger; and Goal 7: Ensure environmental sustainability (UN Development Program, 2017).

However, regardless of the universal acceptance of the need to reduce food waste, globally there is still no consensus regarding the terminology: the FAO views unconsumed food as two phenomena with the loss occurring before retail and waste starting at the point of retail onwards (distribution and household levels). The UN went as far as to divide monitoring food loss and food waste between the FAO, responsible for food loss, and UNEP – for food waste (FAO, n.d.c). The EU level instruments, including a Commission Delegated Decision 2019/1597 of May 3, 2019, supplementing Directive 2008/98/EC, set out a common methodology for the uniform measurement of food waste, which does not include unharvested edible plants (preamble, item 3), among other deviations from the FAO approach.

Another relevant feature of the food waste universe is the high context dependency of the available best practices. They vary between the stages of the food supply chain from production to retail, to restaurants, to households, depend on the type of commodity (storage, processing and other requirements differ for meat and for grains), and, according to the FAO's scenarios, the level of economic development of a country (developing countries tend to struggle more with food loss, while developed countries produce considerably more food waste), they are region specific — some regions with similar economic development waste more than others (FAO, 2019), while the possibility of transfer and scalability of the best practices found successful in a specific country have not been tested sufficiently (Caldeira, C., De Laurentiis, V., Sala, S., 2019).



Source: Adapted from <https://www.fooddrinkeurope.eu/our-actions/foodwaste-toolkit/food-wastage-hierarchy/>

Given that the issue of food waste cuts across the different parts of the supply chain and can be viewed from the environmental, social justice, economic efficiency and other points of view, the study relies on a categorisation tool to make sense of food waste reduction measures introduced by Article 4 of the Directive 2008/98/EC as it is adapted by the EU food and drink industry association (Figure 1).

To summarise, globally the terminology, approaches and data are reliable in terms of indicating the degree of the issue but lack in specificity and comparability. Thus, the categorisation of interventions according to the waste hierarchy is helpful to make sense of the ongoing interventions discussed below.

2.2. How Food Is Consumed (and Wasted) in Portugal

This section of the study focuses on the current food supply and consumption as well as the related waste patterns that would then help contextualise the ongoing food waste reduction measures.

Due to the lack of official data the vast majority of the government and the business sector programs and the civil society interventions rely on the already mentioned 2012 study (Baptista et al.).⁷ The national statistics authority (Instituto Nacional de Estatística, hereinafter, the INE) publishes a wide variety of data and analyses pertaining to food supply and dietary preferences that give a clear view of the conflict of the current consumption patterns with the dietary recommendations of the national health authorities and requirements of sustainable development. For instance, according to the INE, availability of calories for Portuguese citizens is roughly double that of recommended for an adult, while the consumption pattern keeps moving further away from the Mediterranean diet (2017). A glaring example of overconsumption is the portion of products of animal origin (eggs, dairy, meat and fish) in total calories consumed, that in 2012 amounted to 33,8%, while according to the health authorities, it should not exceed 23%. According to the INE, just meat and fish consumption in 2016 three times exceeded the recommended level and were responsible for 16,5% of all consumed calories instead of the recommended 5%.

One country-wide and two local studies of food waste available to the author indicate that between 17% (Baptista et al. 2012, p24) and a half of all food available (In-LoCo 2016a & 2016b) goes to waste across the food production and consumption chain. These studies are validated by the global assessments of food waste. For instance, the FAO estimated in 2011 that 1/3 of all food goes to waste, while other studies point to approximately half of all produced calories not being consumed (Baptista et al. 2012, p. 14). The data shows global variations: the industrialised countries in North America, Europe and Asia on average waste more food than the developing countries (FAO, 2011), therefore, indirectly validating the above cited studies quantifying food waste in Portugal.

Additionally, the indirect indications of food consumption skewed towards unhealthy diet and food waste can be inferred from the public health data. One example is the increasing child and adolescent obesity with consumption of fruit in children of both sexes registering a significant decrease (WHO, 2017). The high incidence of cardiovascular diseases, linked by the World Health Organization (hereinafter, the WHO) to unhealthy diets (2017, May 17), is responsible for almost 30% of all deaths, according to the state health authority (Direção Geral da Saúde, 2015). The WHO also indicates that there are other health implications of high meat consumption, including carcinogenicity of red meat (World Health Organisation, 2015). At the same time, considerable amounts of food appear to go to waste. The surplus calories available for each adult calculated by the INE are not directly reflected in the overall mean body mass index in Portugal, that currently is reported as 26,2, slightly higher than the normal BMI of below 25 (WHO, 2014). It is unlikely that Portuguese residents engage in enough physical activity to shed the excess calories, as according to the WHO (2018) only 35% of residents older than 15 years of age, 38% of children and 12% of adolescents get sufficient levels of activity.

Based on the above discussion of the available data it is possible to ascertain that food is wasted in Portugal at the rate of 1/5 to 1/2 of all available for human consumption, while the dietary preferences are heavily skewed to unhealthy and environmentally unsustainable diets. Below, the study traces meat availability and waste in Portugal to analyse the current government, business and civil society response to the food waste problem in a commodity level case study.

⁷ The methodology used relies on methodologies developed by the FAO (Baptista et al. p. 24).

2.3. Commodity Level: Meat

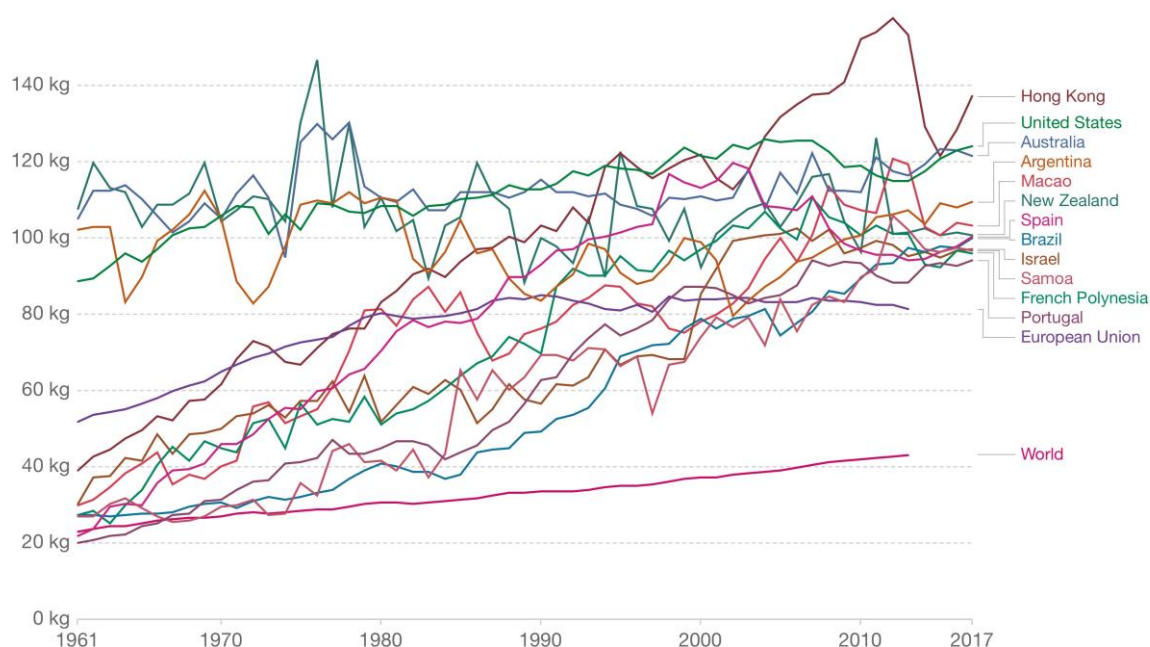
It is helpful to analyse a specific commodity concentrating on its vulnerabilities to waste. Animal protein was selected as an extreme case study (Gerring, 2008) due to the fact that its production for human consumption has a very high environmental impact, also, meat appears to be an outlier as it is wasted at a lower rate than almost any other food type nationally, according to Baptista and the co-authors (2012). The case has an added interest due to the health consequences of meat overconsumption, it is cited as reducing life expectancy, quality of life and increasing burdens on national health systems (WHO. 2015; WHO 2017b); while it is particularly egregious from the social justice point of view to waste meat that has a high caloric value and can provide important source of calories and nutrients for food insecure populations.

Currently, just as there is no data on food waste in general, there is no data regarding waste by commodity. Based on the INE data on annual availability per person in 2014 to 2017, there was a steady increase in availability from 108,2 kg per capita to 117,4 kg⁸ (INE, n.d.b). Data visualisation website 'Our World in Data' (2019), using the FAO data, places Portugal as number 12 in terms of the highest meat availability per capita (Figure 2). The FAO data for 2017 at 94,06 kg per person is below the INE's data point of 113,8 kg.

FIGURE 2: MEAT SUPPLY PER PERSON 1961 TO 2017 (TOP CONSUMERS)

Meat supply per person, 1961 to 2017

Average total meat supply per person measured in kilograms per year.



Source: UN Food and Agriculture Organization (FAO)

Note: Data excludes fish and other seafood sources. figures do not correct for waste at the household/consumption level so may not directly reflect the quantity of food finally consumed by a given individual.

OurWorldInData.org/meat-production • CC BY

Source: UN Food and Agriculture Organization (FAO). OurWorldInData.org/meat-production

There is no official information available on the mode of production of available meat (intensive, organic etc.). However, the data on auto-sufficiency of Portugal in terms of meat production indicates that around 70% of pork and most of small ruminants and poultry were raised locally in 2018. Importantly, almost half of all beef is imported, also, some of locally raised animals may be finished and/or slaughtered and packed abroad, thus compounding the environmental impact through transportation; there is no official information on importing countries (INE, n.d.a). In terms

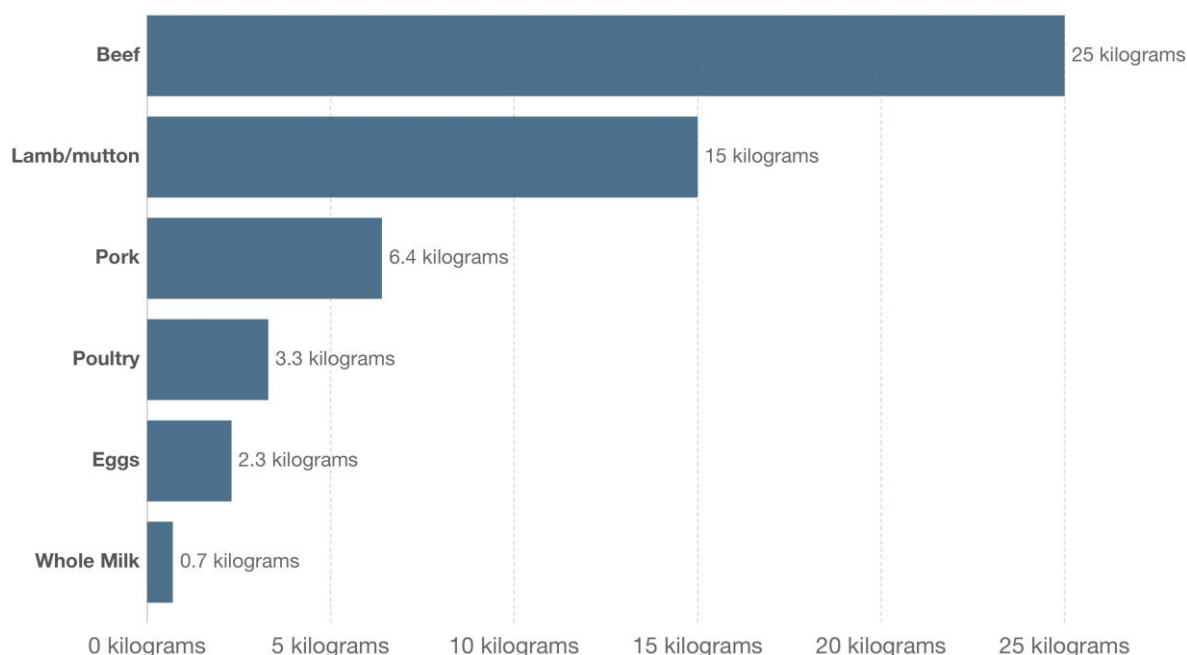
⁸ This number includes all types of meat available for human consumption nationally, both locally produced and imported (minus exports) and includes beef, pork, small ruminants and poultry (INE, 2005). It is not adjusted for increased tourist traffic in Portugal (INE, private communication, January 2020).

of direction of fluxes of meat and animals to be slaughtered for meat, there is information that Portugal imports almost double of the meat that it exports (Neves, 2018). It is necessary to highlight that different types of animals convert calories into meat for human consumption differently (Figure 3), with beef being the most resource intensive and resource inefficient type of meat.⁹

FIGURE 3: FEED REQUIRED TO PRODUCE ONE KILOGRAM OF MEAT OR DAIRY PRODUCT

Feed required to produce one kilogram of meat or dairy product

Quantity of animal feed required to produce one kilogram of meat, egg or milk product. This is measured as dry matter feed in kilograms per kilogram of edible weight output.



Source: Alexander et al. (2016). Human appropriation of land for food: the role of diet. Global Environmental Change. OurWorldInData.org/meat-production • CC BY

Source: Alexander et al. (2016) Human appropriation of land for food: the role of diet. Global Environmental Change. OurWorldInData.org/meat-production

As mentioned in the previous section, food waste globally and in Portugal may be placed at one-fifth to a half of all food available. However, studies demonstrated that not all food is wasted at an equal rate, with meat wasted less than other commodities (Lebersorger, S. et al. 2011). In Portugal, the 2012 study by Baptista et al. concluded that meat is also a less wasted (at around 12%) food category (unlike dairy products, bread and fruit). Still, the global waste of meat, according to the FAO, is around 5% (compared to the 12% in Portugal) with an associated 20% contribution to total carbon footprint of food waste (FAO, n.d.a). The carbon footprint of various protein sources is presented in Figure 4.

⁹ For more details on environmental consequences of animal protein production see Ritchie (2015).

FIGURE 4: HOW DOES THE CARBON FOOTPRINT OF PROTEIN RICH FOODS COMPARE?

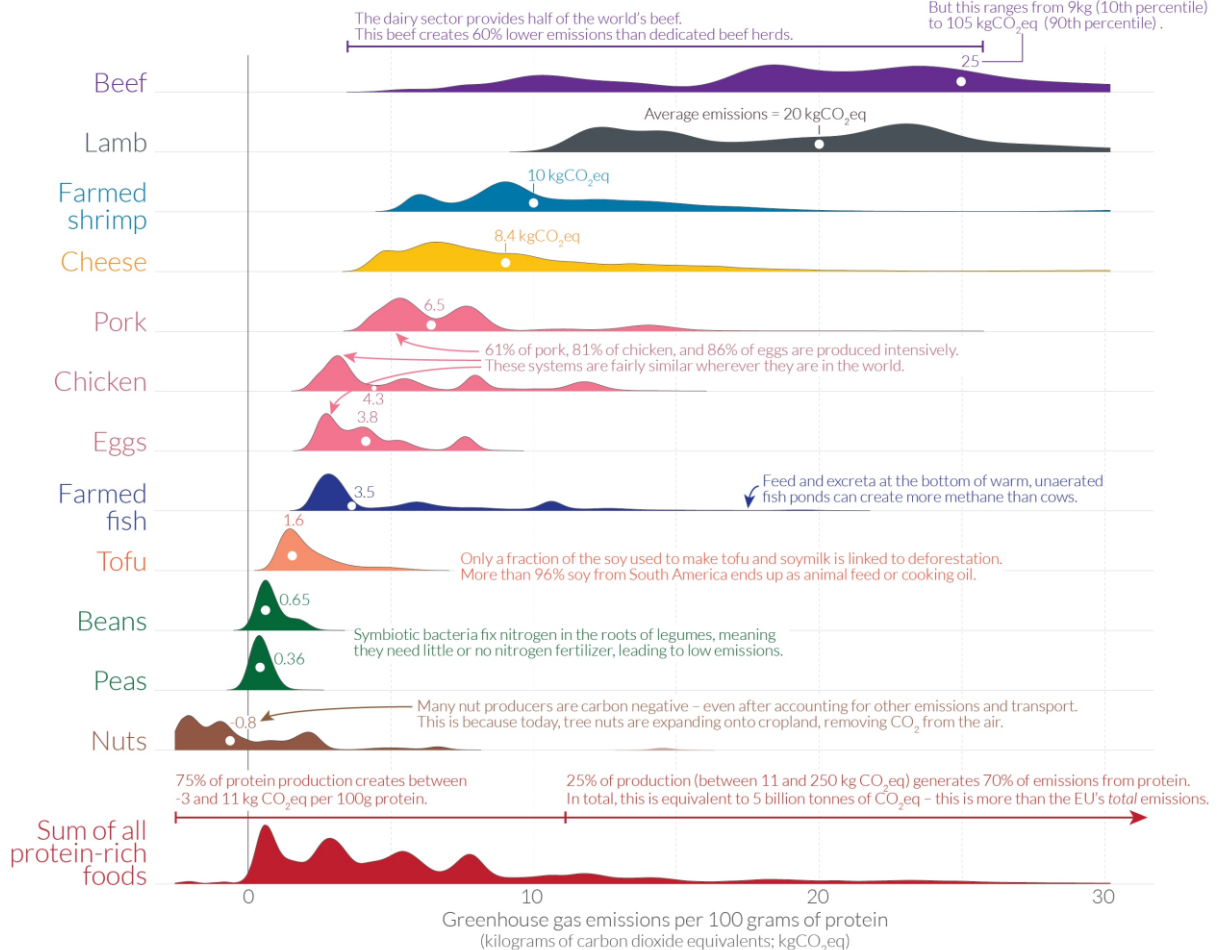
How does the carbon footprint of protein-rich foods compare?

Our World
in Data

Greenhouse gas emissions from protein-rich foods are shown per 100 grams of protein across a global sample of 38,700 commercially viable farms in 119 countries.

The height of the curve represents the amount of production globally with that specific footprint. The white dot marks the median greenhouse gas emissions for each food product.

Producing 100 grams of protein from beef emits 25 kilograms of CO₂eq, on average. But this ranges from 9 kg (10th percentile) to 105 kgCO₂eq (90th percentile).



Note: Data refers to the greenhouse gas emissions of food products across a global sample of 38,700 commercially viable farms in 119 countries. Emissions are measured across the full supply-chain, from land use change through to the retailer and includes on-farm, processing, transport, packaging and retail emissions. Data source: Joseph Poore and Thomas Nemecek (2018). Reducing food's environmental impacts through producers and consumers. *Science*. OurWorldInData.org – Research and data to make progress against the world's largest problems. Licensed under CC-BY by the authors Joseph Poore & Hannah Ritchie.

Source: Joseph Poore and Thomas Nemecek (2018). Reducing food's environmental impacts through producers and consumers. *Science*. OurWorldInData.org – Research and data to make progress against the world's largest problems.

The FAO data on meat availability and Baptista et al. rate of meat waste allow to get a rough estimation of the annual meat waste in 2012 of above 10 kg per capita annually or well above 100 thousand tonnes for the entire resident population (based on population data by Pordata, (n.d.a)).¹⁰ It is possible that the 12 percent estimation of meat waste for later years is conservative due to both increased availability for consumption, as shown by the INE data (INE, n.d.b) and growing number of tourists (OpenAccessGovernment, 2018) as the hospitality sector is globally notorious for generating food waste.

As for the characteristics of the surplus meat, interviewees from the retail and meat industries indicate that the most important distinction in practical terms is between processed/cooked and raw meat. This study anecdotally confirmed that both categories are wasted, but it was not possible to get an estimation of the proportion. This distinction is relevant, as the life cycles of meat diverge at the point of processing including the waste stage. After its expiry date, raw meat (frozen and not

¹⁰ Some important caveats of this estimation include its failure to account for regional differences and for types of meat. There is also no information if any meat is wasted before its expiration date or level of its processing at the point of waste.

frozen) cannot be used for human consumption or disposed of as undifferentiated waste and must enter a separate disposal circuit for animal sub-products (Regulation (EC) 1069/2009). Its disposal or processing may only be handled by specially licensed entities at a cost. Directing such meat for human use could only be possible before its expiration date. Doing so through donation to social solidarity institutions is problematic due to human health related requirements, such as refrigeration, that, according to the interviewees, would place additional burdens on the social solidarity sector.

It is impossible to ascertain if the high availability is a driver of meat waste. Baptista et al., state that 70% of all meat waste occurs in distribution and households approximately in equal parts. They also indicate that the cost of meat amounts to as much as 25% of family budgets (p. 23). Knowing that as of 2018, 2,4 % of population were unable to afford a meal with fish, meat or a vegetarian equivalent every second day (Pordata, n.d.b), it is possible to assume that serious social justice implications may be attached to meat consumption patterns.

As was demonstrated above, well over 100 thousand tonnes of meat may be wasted in Portugal annually. Importantly, meat waste is not homogeneous and for the purposes of this study two categories are distinguished that determine the types of interventions for possible reduction of such waste. The next section concentrates on reviewing current policy and practice of food waste reduction and analyses how both processed and unprocessed meat feature in such interventions.

2.4. Current Food Waste Reduction Landscape

This section overviews the legislative and regulatory landscape and current practice, mapping the main governmental and non-governmental actors, who contribute to food waste reduction both due to the direct focus of their mission or as a positive spillover of their core activities in a different sphere. The purpose of this review is to uncover possible lacunas and/or over-saturation of interventions.

A cursory analysis of the food waste interventions in Portugal shows that the most frequent response is donation of surplus food by the business sector to the social solidarity institutions that distribute it to their beneficiaries. Often such institutions do not rely solely on donations of food diverted from potentially going to waste, but source food from various streams, including corporate donations and food collection drives. Two good examples of this type of intervention are Federação Portuguesa dos Bancos Alimentares contra a Fome and Re-food, that directly channel surplus food to food insecure families.¹¹ Surplus food donations overwhelmingly are ready to consume food and non-perishables with the major sources of donated food being the restaurant and hospitality industry (hereinafter, HORECA) and the retail sector.

Interventions aimed specifically at food waste reduction seem to date back to the early 2010s. DariAcordar is an example of a civil society group that works on various aspects of waste; while promoting donations of surplus food, they also work on preventing waste, for instance, developing educational materials for schools.¹² Cooperative Fruta Feia¹³ can be viewed as an example of prevention directing the fruit and vegetables that do not fit the standardisation patterns to human consumption through a market-based approach since 2013 (Fruta Feia, private communication, 2019). There are a number of highly innovative initiatives, working on different aspects of the food waste issue.¹⁴

However, in terms of their relative weight of initiatives per level of the EU Waste Hierarchy, charitable surplus food donations outweigh other modes of directing surplus food to feed people and work on prevention. While the available data does not allow a reliable quantification of their relative

¹¹ Founded in 1991, the organisation runs donations of prepared food and food baskets and indicates that the current number of its beneficiaries amounts to 390 000, see <https://www.bancoalimentar.pt>; Re-food is a relatively recent project that directs surplus prepared meals to charitable donations and relies on volunteers, see <https://www.re-food.org/pt/como-funciona>

¹² For more information see <https://zerodesperdicio.pt>

¹³ For more information see <https://frutafeia.pt>

¹⁴ Initiatives range from Embrulha by Lipor (a utility company), working on portion sizes and developing a culture of taking uneaten food home after a restaurant meal, to various monetisation initiatives, such as an online market Good After or a take-out app Fair Meals (and its international counterpart Too Good to Go). There are multiple regional sustainable development initiatives with a strong food waste component, such as In-LoCo. Also, some industry associations working on valorisation of resources, such as Smart Waste Portugal. There is also a strong drive to reduce food waste by retailers, SONAE and Jeronimo Martins working for multiple years on reinforcing sustainability of their business models, serving as donors of surplus food through charities. Presentation of some initiatives is available on the website of the CNCDA at <https://www.cncda.gov.pt/index.php/ligacoes/certificacao-selo>

impact, according to the interviewees, the charitable donation has come to be recognised as a major type of response to the waste food challenge (Figure 5).

An important feature of the civil society response highlighted by the interviewees is its relative institutional weakness and limited financial resilience. An overwhelming reliance on volunteers and a limited numbers of paid staff were also mentioned as an important characteristic of the donation schemes. With the social solidarity institutions being the major player in the field, the environmental NGOs tend to view resource efficiency as an important issue, while focusing their activities on food waste to a very limited degree.

FIGURE 5: MAPPING OF FOOD WASTE INTERVENTIONS ACCORDING TO LEVELS OF THE EU WASTE HIERARCHY



Source: The assessment made by the author is based on the total number of initiatives by level of food waste hierarchy; the initiatives are accounted for as presented by the CNCDA and in *Alimentar Boas Práticas* (2020) that provide systematised information about ongoing food waste reduction initiatives (the assessment does not include interventions aimed at use of food waste as animal feed and food waste disposal).¹⁵

The Portuguese state institutionalised its commitment to the issue of food waste in 2016 by creating the CNCDA (Order #14202B/2016 of November 25, 2016) charged with preparing of the National Food Waste Reduction Strategy and Action Plan (*Estratégia Nacional e Plano de Ação de Combate ao Desperdício Alimentar*) finalised on October 16, 2017. The CNCDA is part of the structure of the General Planning Office of the Ministry of Agriculture and is coordinating all of the relevant activities. The National Strategy and Action Plan rely heavily on the its convening capacity and methodological support. Other important implementation components include voluntary industry commitments and awareness raising measures, with a number of adjacent initiatives ran by participants of the CNCDA or the members of its advisory panel, for example, initiatives of the Portuguese Association of Dieticians and the Portuguese Association of Nutritionists (*Associação Portuguesa de Nutrição*, n.d.; *Associação Portuguesa de Dietistas*, n.d.) that highlight the cross-cutting nature of the food waste issue.

Various industry associations are also involved in the CNCDA's advisory panel and appear to be well aware of the issue. However, an important feature of the landscape are the very uneven quantification efforts and varying awareness of economic costs depending on the economic sector (for instance, distribution is cited as responsible for 35% of all meat waste, however, it appears that retailers are more on top of the issue than the HORECA). The production and processing industries in Portugal (with the exception of the fishing industry), according to Baptista et al. (2012), appear to be the least wasteful economic sectors.

¹⁵ CNCDA in its review of the current national practice estimated prevention initiatives at 24% (ENCD, 2017, p. 46).

2.5. COVID-19 Pandemic and Food Waste Reduction

The ongoing COVID-19 crisis poses several salient questions that may influence thinking and practice related to food waste. Some of the important points for consideration are listed below:

- More complex logistics of distributing food to those in need due to both pandemic related limitations (social distancing and the heavy reliance on volunteers);
- Increased role of distribution of surplus food through the social solidarity mechanisms to people who face severe economic difficulties due to the pandemic, the Food Emergency Network (Rede de emergência alimentar)¹⁶ was swiftly set up using existing networks to deliver food to more people in need due to the economic fallout of the pandemic;
- Implications of reliance on imported food and importance of structural shifts towards a more sustainable and local production that already was envisaged in the European Green Deal (European Commission, n.d.a) and the recently unveiled Biodiversity and Farm to Fork Strategies (European Commission 2020 & n.d.b);
- Changes in consumer behaviour due to factors ranging from panic buying to more meals consumed at home (Wageningen Food and Biobased Research, 2020).

No doubt the pandemic highlighted the critical role of food systems in general and food waste generation in particular.

2.6. Existing Lacunas and Necessary Adjustment

Summarising the above discussion, the following spaces for adjustment of current policy and practice appear to be the most salient:

- Absence of official food waste data, that will not be published before 2022-2023;¹⁷
- Current regulation of food waste coupled with the existing modes for running donation schemes create a situation where some food, including some resource-intensive commodities such as meat, cannot be easily donated and fall through the cracks of the current response;
- Prevention measures limited in scope and reach comparative to distribution of the surplus food that potentially lead to a more inefficient, ineffective and inequitable use of limited resources.

The above warrant an integrated and comprehensive review of the policy implementation through incentivising response by the commercial and third sectors to act with the relevant state support in order to prevent food waste, diversify and build capacity to distribute the donated surplus food effectively, and to foster synergies between various sustainable development initiatives, from zero waste to circular economy to proximity agriculture. There will be an opportunity for adjustment once the INE starts publishing its food waste data, but the current lacuna should not preclude adjustment of the ongoing practice towards interventions increasing resource efficiency and social justice impacts. Below, the existing international models of addressing food waste are presented and possible ways of adjusting the current Portuguese response are reviewed.

¹⁶ Founded by the *Banco alimentar contra a fome*, the network uses already established structures to scale delivery of food sourced both as charitable food donations and surplus food and serves as a very timely response to the food insecurity brought about by the pandemic, see <https://emergencia.bancoalimentar.pt>

¹⁷ Importantly, this study does not expressly tackle the data deficiency as it is incorporated into the general EU/national policy stream and will be resolved accordingly.

3. WHILE WAITING FOR THE OFFICIAL DATA

3.1. International Context of Food Waste Reduction Measures

The above chapter has demonstrated that food waste management in Portugal gravitates towards distribution of the surplus food through the charitable institutions, while the prevention measures along the production and consumption chain are more limited. It also highlighted the current lack of data on food waste that considerably complicates design and impact assessment of interventions.

However, data deficiency is not unique to Portugal. Collection of data across food sectors globally is fraught due to the varying methodologies used in production, processing and distribution; variation in data points collected; and the necessity to convert food waste data into 'synthetic indicators' that can be used for comparison like percentages or caloric equivalency. These factors hinder comparisons across time and geographies (Bagherzadeh et al., 2014).

Nevertheless, several countries have made progress in reducing food waste. Some national programs stand out by their data driven approach, the South Korea (hereafter, the SK) being a notable example. The country initiated an early food waste reduction program in the 1990s with a separate collection scheme and a dense framework of sector-specific legislation, ranging from resource efficiency maximisation to feed and fertiliser regulations. According to the SK Ministry of Environment, by 2012, food waste was reduced by 3% to 40 % across different municipalities. This was achieved through a heavy reliance on regulatory measures, investment into technological solutions, such as a "polluter pays" schemes that use radio frequency IDs, 95,3% of still generated food waste being recycled into animal food and compost. Total investment made amounted to USD 144 million (approximately EUR 131 million) between 1996 and 2011 (Bagherzadeh et al. 2014, p. 13).

The United Kingdom is at the opposite side of the spectrum in terms of the involvement of the state. Focusing on the sector specific recommendations and voluntary commitments for various parts of the supply chain, the UK used data for benchmarking and developing guidance for the initiatives. The country was one of the trailblazers in the EU with its Waste and Resources Action Program created in 2000 that has a registered charity status, promoting circular economy with a government allocated funding of GBP 16,8 million (approximately EUR 17 million) in the fiscal year 2018-2019 (WRAP, 2019a), that is topped up by its income generation activities. Its food waste initiative, "Love Food, Hate Waste" (WRAP, n.d.b), acts as a hub for collaborations with governmental and academic institutions, for example, it administrates the Food Waste Reduction Fund (directing food to charitable redistribution) on behalf of the Department for Environment, Food and Rural Affairs (DEFRA) and distributes funding for municipal food waste interventions (WRAP, 2019b). Impact of food reduction measures was reported in the country's Voluntary Report on the SDGs demonstrating a decrease of household food waste from 8,3 million tons in 2007 to 7,3 million tonnes in 2015 (HM Government, 2015). WRAP is committed to promoting the best practices of food waste reduction having published guidance for different economic actors and for specific commodities, for example, raw meat (WRAP, 2012). Having recognised that progress over the years is not stable, WRAP more recently, in 2015, started promoting a voluntary commitment across the food supply chain with the purpose to make food production and consumption more sustainable (WRAP, n.d.a)

A significant difference in the two countries' approaches is the role of the state: in the SK the state is very involved through legislation, regulation and oversight; in the UK the state outsourced activities through a charity, while preferred interventions include voluntary mechanisms and incentives. Several other countries reviewed by the CNCDA in the national strategy fall within the spectrum set between the reliance on regulation and enforcement evident in the SK and the UK featuring the best practices and voluntary commitments: the Spanish and Italian approaches in 2017 were closer to the UK decentralised approach, while France appeared to have opted for a regulatory route closer to the SK solution.

The current practice and legal framework aimed at tackling food waste in Portugal tends to be closer to the UK approach with its main features including coordination, collaboration, voluntary industry commitments and surplus food redistribution through the social sector with a limited regulatory burden. Below the study lists possible productive adjustments that may be made in Portugal based on the existing evidence to deliver better efficiency, efficacy, equity and environmental sustainability of its food waste response.

3.2. Making Sense of Waste Reduction Policy and Practice

Globally, food waste reduction approaches seem to have originated in a twofold way: through perceived need and through international frameworks, such as the SDGs. How and why a specific food waste reduction strategy is selected and implemented on the national level appears to depend on multiple factors, including institutions in place, the political culture (including attitude to the role of the state), while economic sector-based interventions have to be commodity and supply chain specific, as each commodity is regulated by its own sets of norms that may differ depending on the level of processing, intended use, etc.

Being focused on the country level, this study is guided by the interventions documented elsewhere, such as the two country level cases (the SK and the UK) described in the previous section. We will use these examples¹⁸ as the 'ideal types', not as a case for policy transfer. It is important to highlight that in normative terms neither approach is 'better' than the other, they are determined by different attitudes to the state interventions, oversight mechanisms and differ in other meaningful ways. Here they were selected merely as guides for policy options design due to the following factors: 1. they appear to be some of the longest running (over 20 years); 2. there is a documented trail of interventions, investments, impact and adjustments; 3. both countries' approaches are covered in academic publications and the media; 4. both countries' approaches have resulted in documented decrease in food waste.¹⁹

In terms of the economic and political structures, both the UK and the SK are members of the OECD, ranking globally among top 30 in terms of GDP (23rd and 30th respectively, according to the World Bank in 2019), while Portugal is the 42nd). All three countries are developed democracies. Portugal has an open civic space, while the UK and the SK are ranked as countries with a narrowed civic space (Civicus, 2019).

In terms of their relevant features, it is useful to label the two approaches as the centralised and the decentralised ones respectively, these two 'ideal types' will be referred to hereafter. They are viewed here rather as vectors for possible adjustment of the existing Portuguese policy during the continued absence of official data than a rigid policy framework. However, as we see in the UK example with appropriate benchmarking and interventions in place year-on-year changes may be positive and negative, or there may be no change.

The study goes on to use the following criteria to analyse and compare the respective policy options (current policy (Portuguese), centralised and decentralised) to address the lacunas determined in the analysis above:

- change in the current costs;
- legislative inputs;
- regulatory burdens;
- political acceptability (affinity or considerable break with existing policies);
- changes to institutional frameworks;
- reach and range of interventions in terms of commodities and links of the production and consumption chain;
- cumulative outcomes in absolute waste reduction;
- cumulative outcomes in awareness and buy-in by economic actors and consumers.

These criteria are adapted to the policy problem analysed here and geared toward 'the principal objective to be maximised' (Bardach, 1996). With the problem determined by this study being a response skewed towards distribution of a limited scope of food types, these criteria are tailored to assess the options on one specific merit: to what extent they can contribute to the desired outcome (incentivising interventions aimed at the underserved aspects of the problem with a positive bias to the interventions with a higher environmental, social and economic benefit), while at the same time being feasible in terms of resources needed and political acceptability.

¹⁸ More detailed information on the UK case see WRAP <https://www.wrap.org.uk>; on the SK case, Ju, M. et al. (2016) on recycling, Waste Management Review (2015) on legislation and Broom D. (2019) for an overview of the overall approach.

¹⁹ Discussing the concept of policy transfer is outside of the scope of this study, however, it is important to expressly highlight that the discussed policy options are used for analytical purposes as aids to categorise types of approaches and not as a recommendation for policy transfer.

The section below considers strengths and weaknesses of the centralised and the decentralised approaches as applied to the Portuguese context.

3.3. Centralised vs Decentralised Food Waste Management

In this section the study reviews and compares characteristic features of the centralised and the decentralised approaches to food waste management and assesses how the current Portuguese approach aligns with them and can be adjusted to deliver a more comprehensive response.

The main feature of the centralised approach is the central role of the state that legislates, regulates, allocates resources, ensures oversight and otherwise takes the lead over the solution of the food waste problem, while the following features stand out: 1. measures involve most economic sectors and commodity groups, potentiating considerable reduction in food waste with an additional bonus of flushing out economic sectors that are prone to externalise food waste costs; 2. measures are mandatory, with sanctions for failure to comply;²⁰ 3. generation of reliable data per sector and per commodity, informing policy adjustments; 4. inclusion of household waste production into interventions, with strong incentives to reduce food waste and close monitoring.

On the contrary, the decentralised approach is quite ‘soft’ in terms of regulation and enforcement, focusing instead on the incentives for behaviour change from production to household level, heavily involving civil society organisations. The toolbox includes: 1. voluntary economic sector and actor commitments; 2. compiling and distributing information on the best practices pertinent to different stages of production and consumption; 3. raising-awareness and buy-in through case-studies for different types of economic actors demonstrating benefits of adopting food waste reduction measures; 4. focal point for the policy is a government funded entity set up as a charity; 5. absence of extensive legislative, regulatory and enforcement framework.

Table 1 below compares the centralised and the decentralised approaches to the current Portuguese approach to tackling food waste using the criteria listed in Section 3.2.

TABLE 1: COMPARISON OF APPROACHES TO FOOD WASTE REDUCTION

Criteria	Current Policy in Portugal	Centralised approach	Decentralised approach
Change in current costs	Limited dedicated funding	Per capita budget is comparable to the decentralised approach. Considerable reliance on income generated through monetising recycled food waste and direct costs to households and businesses, i.e. “polluter pays” approach	Per capita budget is comparable to the centralised approach. Reliance on the state budget and own income generation by the focal agency, partially distributed to economic actors and civil society’s initiatives; limited reliance on direct payments by households and businesses
Legislative inputs	Very limited changes to legislative framework	Specialised sectoral legislation, up to full ban on landfilling food waste	Limited changes to legislative framework
Regulatory burden	No significant changes to regulatory framework	Specialised sectoral regulation	No significant changes to regulatory framework
Political acceptability	Neutral (the issue has moderate importance on the political agenda)	High political acceptability required for state driven interventions with high regulatory burden	Neutral (few additional regulatory and other burdens associated)
Changes to institutional frameworks	Establishment of interagency and intersectoral Commission, increased capacity of several types of interventions (i.e. charitable donations)	More interventionist approach to regulation and oversight requires robust institutional response	Increased capacity of involved institutions (primarily, the focal agency), municipal institutions, NGOs, SME

²⁰ Implementation of a centralised approach potentially could raise other questions that may or may not be related to food waste such as use of personal data for enforcement measures, acceptable degree of the state oversight over economic actors, sharing information about businesses externalising food waste costs, among others.

Criteria	Current Policy in Portugal	Centralised approach	Decentralised approach
Reach and range of interventions	Atomised, with a focus on charitable donation of surplus food	Thorough involvement of most economic sectors and down to households	Increased relative to the Current Policy, extending to previously underserved food groups and levels of food waste hierarchy
Cumulative outcomes in absolute waste reduction	No data	Up to 40% increase relative to benchmark level	Ranging between minor increase in waste to 12% reduction from benchmark level
Cumulative outcomes in awareness and buy-in by economic sectors and consumers	Some awareness, moderate acceptance of economic sectors, low buy-in by households, HORECA	High awareness of economic actors	Increased awareness and buy-in by economic actors relative to Current Policy

Source: prepared by the author.

To summarise, in Portugal the crucial elements of the decentralised approach are already in place, however, a slight adjustment is needed to reinforce interventions aimed at prevention, as well as at a more effective distribution of food that currently does not enter the donation circuit, such shift would bring about a higher social, economic and environmental benefit. Importantly, to enhance the capacity of the current efforts learning from the decentralised approach, a commitment to reinforcing the focal point (the CNCDA) and greater reliance on economic actors and civil society are necessary.

4. CONCLUSIONS AND RECOMMENDATIONS

Tackling the food waste problem in Portugal has been a joint effort of the civil society and business sector, while the state, through the CNCDA has taken on the important role of inter-agency coordination, provision of technical expertise and the best practices. Globally, countries choose one of two paths to food waste reduction: some countries choosing to tackle the issue through the mechanisms of the state, while others, including Portugal, have relied on a range of decentralised interventions. Both approaches have been shown to bring about positive results. International institutions produced a wealth of knowledge related to the issue available to government, researchers and practitioners working on reducing food waste, that this study also heavily relies on, notably the FAO and the EU REFRESH Project.²¹

Institutionally, the CNCDA has established itself as a reliable coordination centre for activities aimed at food waste reduction reflecting the interdisciplinary and multisector nature of interventions required to contribute to the resolution of the food waste problem. Recommendations below recognize the crucial role of the CNCDA as the focal point for activities and envisage further increase of its competencies, convening power and institutional capacity to put in place a comprehensive range of tangible incentives for food waste reduction for all economic sectors and effective and comprehensive diversification of initiatives aimed at redistribution of surplus food to feed people.

The Commission is placed perfectly at the focal point of various sustainable development and food policy initiatives as an inter-agency coordination centre aligned with the EU-wide comprehensive policy vision, including the EU Green Deal and the Farm to Fork Strategy that both cross over between sustainable development, food systems and public health. Three main blocks of recommendations are presented categorised by the sector, the government, business and the non-profit:

²¹ EU Platform on Food Loss and Food Waste (2019). Recommendations for Action in Food Waste Prevention, WWF-WRAP (2020), Caldeira et al., 2019, FAO 2011.

1. Government: altogether, the thrust of this recommendation is to reinforce the ability of the CNCDA to coordinate food waste reduction measures, highlight the importance of prevention efforts and diversify redirection of surplus food to feed people, thus better enabling it to deliver the Operational Goals of the National Strategy and Action Plan with a particular focus on Goal 7 (Cooperation Among Actors), as well as Goals 1 to 5, thus working to advance Strategic Goal 1 (Prevent) (2017, pp 29-32). More specifically:
 - Extend convening power of the CNCDA by inviting new agencies and entities to the Commission to increase reach and impact of its measures, including entities that work on small and medium business development, social innovation, development and cohesion;
 - Incrementally increase dedicated staff and budgetary allocations for the CNCDA;
 - Extend and fine-tune the CNCDA's competencies to implant the food waste issue into the national implementation of the EU Farm to Fork Strategy and the post-pandemic adaptation and mitigation initiatives;
 - Create an earmarked funding pool within the next funding framework to encourage the business and social economy innovation aimed at reducing food waste;
 - Enhance synergies by promoting adjacent initiatives that contribute to preventing food waste within the circular economy and the public health toolboxes;
 - Promote greater inclusion of food waste information into the obligatory school curriculum alongside nutrition and sustainable dietary choices;
 - Review current policies to promote waste reduction and sustainable consumption such as public procurement and waste management fees;
 - Contribute to collection and sharing data on food waste by economic actors through relevant incentives;
 - Make widely available case studies and methodological recommendations promoting economic, environmental and social benefits of food waste reduction in each link in the food production and distribution chain and for various commodities;
 - Incentivise scaling up of tested initiatives already in place to involve new entities and regions;
 - Collaborate with relevant actors on evidence-based behaviour change campaigns for the consumers and HORECA;
 - Make sure the best practices aimed at prevention of food waste are widely available to consumers.
2. Business Sector: Awareness and adoption of food waste reduction measures appears to be uneven throughout various links in the production chain. To prevent overproduction of food that will not find its consumer, be it in the field or in a restaurant, as well as to encourage innovative modes of monetising surplus food, the following are recommended:
 - Reinforce business planning and forecasting capacities of businesses along the entire production and distribution chain, including emergency conditions, such as the COVID-19 pandemic;
 - Explore innovative models of monetising surplus food that does not enter the donation circuit;
 - Raise awareness of management and employees about food waste costs through separate collection and similar measures and regularly review procedures for sustainable practices and compliance;
 - Encourage sustainable consumer behaviour through creative marketing;
 - Seek relevant guidance from the CNCDA directly or through industry associations;
 - Reinforce the role of the industry associations in raising awareness of members and incentivising relevant behaviours through voluntary commitments, food waste reduction targets, prizes and similar activities.

3. Non-Profit Sector: non-governmental organisations have been at the forefront of food waste issue for a long time; it is necessary to add to the already well-developed surplus food donations capacity to include currently excluded products and incentivise other types of initiatives that would include food that currently does not enter the donation circuit, as well as the initiatives directed at preventing food waste all the way down to the household level. The recommendations for the non-profit sector include:

- Build capacity to ensure comprehensive reach of projects and lasting impact of their activities;
- Promote local, regional and national partnerships to share the locally tested best practices and ensure efficient use of organisational resources;
- Build on existing and scale up educational component on food waste into environmental, public health, and other relevant non-profit initiatives;
- Work on consumer awareness of food waste issues through social marketing campaigns and similar interventions;
- Seek guidance from the CNCDA on methodologies for food waste reduction at household level as well as for input on related issues such as public health and sustainable consumption.

To conclude, building on the institutional framework and practice of food waste reduction already in place Portugal it is feasible to address the existing lacunas and prepare for adjustments once the food waste data is available.

The COVID-19 pandemic made glaringly obvious the fragmented nature of food systems and sustainable production initiatives. Food waste is both part of all these problems and a separate social, economic and environmental issue in its own right.

Actively adding prevention of food waste to the existing repertoire of interventions and diversifying use of surplus food to make sure all food groups are included will contribute to Portugal achieving the SDG Indicator 12.3 and make its food system more resilient and sustainable.

ACKNOWLEDGEMENTS

The author would like to thank the Calouste Gulbenkian Foundation and its LEAP – Policy Development Initiative, the International Centre for Policy Advocacy and the IES – Social Business School for their commitment to evidence-based policy advocacy and unwavering support throughout the program. This study would not be possible without the invaluable insight of Andreas Kraemer, the knowledge most generously shared by the participants of interviews conducted in the course of the study, and the friendly help of fellow LEAPers.

DISCLAIMER

This document resulted from the participation of its author in a capacity building program of the Calouste Gulbenkian Foundation. LEAP – Policy Development Initiative is a capacity building programme dedicated to evidence-based public policy recommendations on sustainable production and consumption, designed for researchers and employees of non-profit organisations, universities and public administration. The content and opinions expressed are the sole responsibility of its author and do not necessarily reflect the policy or position of the Calouste Gulbenkian Foundation and its LEAP – Policy Development Initiative partners. For more information about the project: <https://gulbenkian.pt/en/project/leap-policy-development-initiative/>

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Equality in the access to sustainably produced food: a way to foster local vegetable sustainable production

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ABSTRACT

As Qu Dongyu, Director-General of the Food and Agriculture Organization of the United Nations (FAO), highlighted, “consumers lack food diversity instead of food quantity” (Sustainable Innovation Forum 2019, COP 25 side event).

This work focuses precisely on the relationship between access to diverse and sustainable food and the socio-economic vulnerability of Portuguese families. It questions, in particular, whether public policies are responding to ensure that poor families have access to quality food, in a broader sense than merely nutritional.

In order to change society’s habits towards a more sustainable food consumption, knowledge about food choices and decision-making is certainly important, as well as to understand the networks that currently prevail in food supply, a dimension brought to light by new ways of scarcity caused by the pandemic crisis.

The research intends to trigger more sustainable food production and supply systems, directing public procurement to this purpose. The analysis of the food basket held by the Operational Programme of Support to the Most Deprived (PO APMC) financed by the Fund for European Aid to the Most Deprived (FEAD) allowed to identify possibilities to combine social and environmental policies.

Through the programme, the State ensures the nutritional safety net, but the adopted scheme shows environmental unconformities. Experiences collected from the field, where alternative food banks were already functioning or emerged during the lockdown, enlighten a transformative approach to re-engineer the food network, combining public investment with consumer communities and producers, and keeping in mind the engagement of the most deprived.

Keywords: Sustainable food consumption, local consumption, sustainable vegetables production, food distribution programmes, poverty-oriented policies.

JEL classification: F64, I38.

RESUMO

Qu Dongyu, Diretor-Geral da Organização das Nações Unidas para Alimentação e Agricultura (FAO), destacou que “falta aos consumidores diversidade alimentar ao invés de quantidade de alimentos” (Fórum de Inovação Sustentável 2019, evento paralelo da COP 25).

Este trabalho centra-se precisamente na relação entre o acesso a alimentos diversos e sustentáveis e a vulnerabilidade socioeconómica das famílias portuguesas. Questiona, em particular, se as políticas públicas salvaguardam que as famílias pobres tenham acesso a alimentos de qualidade, num sentido mais amplo do que o meramente nutricional.

Por forma a alterar os hábitos da sociedade, rumo a um consumo alimentar mais sustentável, é certamente importante conhecer as escolhas alimentares e os elementos que influenciam a tomada de decisão, bem como compreender as cadeias de valor que atualmente prevalecem no abastecimento alimentar, dimensão que perde opacidade devido às novas formas de escassez provocadas pela atual pandemia.

A pesquisa pretende fomentar sistemas de produção e abastecimento de alimentos mais sustentáveis, direcionando as compras públicas para esse fim. A análise do cabaz alimentar do Programa Operacional de Apoio aos Mais Carenciados (PO APMC) financiado pelo Fundo Europeu de Ajuda aos Mais Carenciados (FEAD), permitiu identificar possibilidades de conjugação de políticas sociais e ambientais.

Através do programa, o Estado pretende garantir a segurança nutricional, mas o esquema adotado apresenta inconformidades ambientais. As experiências recolhidas no terreno, em que formas alternativas de bancos de alimentos já estavam em funcionamento, ou surgiram durante o confinamento, inspiram a abordagem transformadora para reengenharia do sistema alimentar proposta neste estudo, combinando o investimento público com comunidades de consumidores e produtores, não deixando de ter em mente o envolvimento das populações mais carenciadas que beneficiam diretamente deste apoio alimentar.

Palavras-chave: Consumo sustentável de alimentos, consumo local, produção sustentável de vegetais, programas de distribuição de alimentos, políticas de apoio à pobreza.

Classificação JEL: F64, I38.

1. OLD AND NEW DILEMMAS AROUND SUSTAINABLY PRODUCED FOOD

This study starts by questioning the effective inclusion of the Portuguese population with greater socio-economic vulnerabilities in the transition to a more sustainable diet, which has emerged as an imperative path in national and international bodies, of which the European Union's Farm to Fork strategy is an example. If this process is considered to be so decisive, what effect does it have on public policies to suppress food shortages?

This problem relates, on the one hand, to a social dimension, the safeguard of the population's health and nutritional balance, and on the other hand, to the environmental aspect that is now pressing and refers to the type of food that is distributed to the population, its origin and the environmental costs involved.

In order to understand the national scope and to what extent this environmental dimension is present, or not, in the strategy and measures underway, the investigation continued in search of public investment used to ensure food supply for needy families. The measure selected for analysis, among the various PO APMC programs, was the food basket distributed to families across the country, since this is the instrument with the greatest expression in the territory.

The analysis of the particularities of implementation and execution of this measure would then allow to find ways to enhance the power of public purchases in promoting more sustainable food realities.

2. UNBALANCED RECIPES

The analysis of food consumption and its exposure to inequalities is a matter of social justice, and in fact, the pledge for adequate food is a legal obligation under international law. Recognized as a human right in the Universal Declaration of Human Rights (Article 25) in 1948, there are now 169 State Parties (as of May 2019) to the International Covenant on Economic, Social and Cultural Rights. This is a binding agreement, which provides a legal guarantee for the fundamental right to be free from hunger as well as the progressive realization of the right to adequate food (Article 11) (FAO, 2019).

In order to fulfil this human right, and the vision of "a world free from hunger and malnutrition, where food and agriculture contribute to improving the living standards of all, especially the poorest,

in economically, socially and environmentally sustainable manners”, the Food and Agriculture Organisation (FAO) outlines the importance of the 2030 Agenda. The 2nd Sustainable Development Goal (SDG) is to call on the world to eliminate hunger, achieve food security and improved nutrition and promote sustainable agriculture (FAO, 2019).

Making the case for healthy and sustainable diets, the FAO Director-General stressed that “there are over 820 million hungry people in the world”, but “while the total number of those chronically undernourished has been increasing in recent years, the rate is decreasing compared to total population of the planet”. In the meantime, “over 2 billion adults, and nearly 380 million children and adolescents, are overweight or obese”.

He argues that “our current food systems are failing to ensure food security for all and deliver on healthy diets whilst contributing to environmental degradation. From agricultural production to processing and retailing, there is little space for fresh, locally produced foods as high-yielding and profitable crops take priority. In richer countries, and a growing number of lower income countries, unhealthy foods are cheaper, readily available, and more convenient. Unhealthy diets are one of the leading causes of death across the globe from non-communicable diseases (NCDs), including cardiovascular diseases, diabetes and certain cancers, taking a large toll on national health budgets.” (FAO online news, 2019).

The critical issue is no longer the quantity of food produced, but mainly the quality of the food. As outlined by the European Commission Communication in 2010, “future food security challenges include population growth, pressures on natural resources and ecosystem services, and adverse impacts of climate change on agriculture, affecting growing conditions and making adaptation measures necessary.” According to the United Nations Committee on World Food Security a person is considered “food secure” when he or she has the physical, social and economic access to sufficient, safe and nutritious food that meets his or her dietary needs and food preferences for an active and healthy life. The four pillars of food security are availability, access, utilization and stability (CSF, 2017).

Building upon this reality there seems to be a global need to draw integrated policy frameworks that can address SDG 2, linking it to other SDGs, such as SDG 12, which intends to ensure sustainable consumption and production patterns, and SDG 10, which aims to reduce inequality within and among countries (UN).

Trying to figure out how to control the risks of climate change, the United Nations’ Intergovernmental Panel on Climate Change (IPCC) outlines the need to adapt decision-making, emphasizing the relevance to understand the patterns of production and consumption in its culturally, economically and politically embedded dimensions, but also in terms of intrinsic and extrinsic psychological needs. Given the strength to influence markets that lies on consumers’ choice, changing food consumption habits is a key element in increasing sustainability, both on the consumption and production side (IPCC, 2017).

In the European sphere, the new EU Commissioner for Cohesion and Reforms, Elisa Ferreira, is responsible for the plans for a Just Transition Fund in order to support Europe’s workers and consumers as we shift to a more energy efficient, renewables-focused and low-carbon economy. This in line with the wider objectives of the European Green Deal and considering key economic, social and territorial goals, structural challenges, and the local needs of each region, and using cohesion to support the sustainable development of cities and urban areas, foster the digital and green economy, and address poverty, transport, housing and climate challenges (European Parliament news, 2020).

The translation of international targets into the Portuguese reality can be slow, and, in particular, the inclusion of poor consumers in a more sustainable path of consumption, being thoughtful about what they buy, does not seem to be on the agenda yet. Even though this would be justified by the analysis of food consumption reports. The results of the last National Dietary Survey (2017) show that: half of the Portuguese don’t eat enough vegetables and fruits; more than 95% of the population exceed the level of sugar recommended by the World Health Organization (WHO); Portuguese men and women eat too much salt; in 2015 -2016, 10% of the families in Portugal were experiencing food

insecurity, which means they had difficulty to provide enough food to the whole family associated with low financial resources; almost 6 in 10 Portuguese are obese or pre-obese and the prevalence of obesity is always bigger in less educated individuals.

According to the last National Dietary Survey (2017), 21% of all the food consumed in Portugal has low added nutritional value, like cookies, snacks, cakes and sweets. This represents an advantage over non-processed and fresh food, reinforcing the economic capacity of this industry in creating publicity campaigns and constant promotions, which may be extremely appealing, especially to the segment of population with less nutritional and economic literacy. It is not surprising that diseases like diabetes, obesity or hypertension can be 2 or 3 times more prevalent in the population with lower school level.

Reflecting about the data from the last report of the Programme to the Promotion of Healthy Dietary (2018/2019), the responsible for the Programme, Maria João Gregório, argued that unhealthy habits are one of the main determinants of the loss of healthy years of life. The low consumption of whole grains, fruit and oil fruits are the main associated factors, stressing that Portuguese people should reduce the meat and fishery consumption and use other sources of protein (Jornal Público, 6th November 2019). With these pleas in mind, in the end of 2019, the Programme launched the campaign “Eating well, a recipe for life”, advertising all over the country, in televisions, radios, newspapers and outdoors, the need to eat more fruits and vegetables and drink more water.

Despite these general results, the lack of information and studies about the Portuguese low-income population’s food consumption suggests that this segment should be treated separately in future studies, because there is already some support to a significant association between socio-economic status, represented by the variables education and income, and food consumption in the Portuguese context. In fact, a study undertaken in 2017 reached the conclusion that individuals with higher income and education levels are more likely to adopt healthier dietary habits, including the consumption of fish, soup, fruits and vegetables, dairy and natural juices. While the more vulnerable social groups seem to be more exposed to food insecurity (Velhinho, 2017).

This cycle of exclusion from a secure dietary, reinforcing the market to produce cheap and low nutritional products and having a particular impact on the lower socio-economic segments of the population, should be treated as one of the poverty dimensions, at a public and national level.

According to FAO, “consumers around the world have a right to expect that the foods they purchase and consume are safe and of high quality. Good, safe food is the foundation of a nutritious diet. In addition to safeguarding the well-being of consumers, food safety is also crucial to enable agricultural producers to gain access to markets. This in turn contributes to economic development and poverty alleviation.” (FAO, 2019).

3. NEW INGREDIENTS FOR RESILIENCE

The current international scenario associated with the pandemic crisis caused by COVID-19, rather than ruining the food system installed, brings to light many of its previous failures concerning food sources and supply chains.

Tim Lang, the United Kingdom leading expert on food policy, draws attention to the fragility of a system where a small number of corporations dominate food retailing, with just eight companies controlling 90% of the food supply. He also underlines “the prioritisation of price that has hollowed out the national agriculture, so that the primary producers get the smallest slice of the cake”. He also states that the international situation in response to the virus “shows a massively fragile just-in-time supply chain which could easily collapse; a depleted agriculture sector which produces only around 50% of the food we actually eat, leaving us at the mercies of the international markets; and production methods which are damaging to the environment and human health” (Guardian, March 23rd 2020).

Likewise, in Portugal consumers are used to full supermarket shelves, with a wide range of ingredients at good prices, but the circumstances caused by the first lockdown, in May 2020,

triggered panic buying and missing basic goods. The awareness of the dysfunctions and lack of self-sufficiency of the actual food system increased and the gap between rich and poor in terms of wealth, income and therefore access to food intensified.

Somehow, the food circuits' slowness and the sudden resulting scarcity exposed the complexity of the chains that enable cheap food to be available, turning more transparent the unsustainable costs on the way.

The common cost-benefit ratio analysis of the food trade models, more focused on the short-time, also known as price, often neglects from the equation long-term costs such as the environmental and social ones.

In order to address this problem and to challenge business as usual to start thinking about the future - the depletion of resources, the energy and water expended in production, the CO₂ emissions associated with transport, or the replacement of waste by a circular circuit, etc. - some business standards began to introduce some environmental and social criteria to evaluate performance. For instance, the Dow Jones Sustainability Index World and the Global Reporting Initiative (GRI) mix conventional financial indicators with other sustainability dimensions.

The mitigation of climate change is also related with the food scenario, taking into account the compromises needed to meet the Paris Agreement goal: "keeping a global temperature rise this century well below 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius" (UNFCCC - United Nations Framework Convention on Climate Change online). It is reasonable to argue that it will not be enough to concentrate the emissions' reduction efforts in the productive economic sector, given the freedom that allows parts to establish their own plans to meet the 2050's goal. If consumption habits do not change too, the result may be a dysfunctional reality where countries decarbonize the production as imposed by the Agreement, but keep a carbonized consumption enabled by imports, and this will block the global accomplishment of the goals (Santos, 2018).

As Greta Thunberg said during COP25, "creative accounting will not save us". To change markets effectively, namely the food market, there must be accountability, but also public support and behaviour change. Education is essential to obtain good results in terms of decarbonisation of services and consumption, and it is vital to spread the dangers and the results, the causes and effects of climate change (Santos, 2018).

On the European level, the President of the European Council announced his clear goal: "to make Europe the first climate-neutral continent on the planet by 2050" (Charles Michel, European Council of the EU online). The intention is translated into the presentation of the European Green Deal communication by the European Commission, in December 2019, as the new proposed growth strategy for the EU to achieve climate neutrality by 2050. According to the European Council, "this strategy requires a holistic approach in which all EU actions and policies contribute to its objectives. It recognises that policy areas - including climate, the environment, energy, transport, industry, agriculture and sustainable finance - are closely interlinked" (European Council of the EU website).

In the Portuguese context, the Integrated Strategy to the Promotion of a Healthy Dietary (EIPAS) also uses a systemic approach planned across seven different Ministries – Finances, Internal Affairs, Education, Health, Economy, Agriculture, Forests and Rural Development, and Sea. The strategy aims at fostering adequate food consumption and the consequent improvement of the citizens' nutritional state, with a direct impact in prevention and control of chronic diseases.

The first strand of the strategy intends to "modify the dietary environment" and its measure 11 is directed to "encourage public procurement of food items to use short chains, organic or integrated means of production and, to do so, proposes the elaboration of a guide with clear indications, either about the award criteria, as about the factors and sub-factors in which they densify. This guide should bring closer the producer and the consumer, namely in the food services managed by the direct and indirect state administration" (EIPAS website). The reported state of the guide is "ongoing" (2nd Semester Progress Report, 2019).

The national Law no. 34/2019, which defines the selection and acquisition criteria for food products, promoting sustainable consumption of local production in public canteens and mess halls, also contributes to meet this target. Its article 3rd states that food supply must mandatorily weigh quality, origin, and environmental impact in the following terms:

Origin and Environmental Impact (4th article)

The selection of proximity products must weigh the acquisition of products that reveal: less logistic and distribution costs; less environmental impacts due to distance, transport and packaging, attributing more value to the production that has all its phases in the sub-region (intercity entity), or adjacent; and origin in seasonal production.

Quality (5th article)

Acquisition of certified products with at least one of these certifications schemes (EU quality schemes): Organic Production Mode (MPB), Protected Designation of Origin (PDO) or Protected Geographic Indication (PGI).

According to this law, the preclusion to apply what is stated, due to the non-existence of products with the listed characteristics, or by force of some sectorial legal regime, or even for specific technical requirements, must be substantiated (Law no. 34/2019).

In addition to these binding targets, a more resilient food system is also emerging in Portugal due to some private or community projects.

One good example of the promotion of healthier consumption habits beyond the public scope is Saúde.come, a project funded by EEA Grants, with the purpose to promote food security, through the collection of missing data about food insecurity and its determinants in Portuguese families, focusing on adolescents and elders. The project will also carry out two pilot studies of interventions to promote healthy lifestyles, regarding healthy eating habits and physical activity in the mentioned priority groups (Saúde.Come website).

There are also examples of communities of consumption, as Herdade do Freixo do Meio, where its members/consumers act as investors, sharing the responsibility for the sustainable production of greens. Associations like Fruta Feia are struggling to avoid waste of locally produced fruits and vegetables that do not match the mass-market requirements. Combining an environmental and social focus, by making and distributing green meals, some social-cultural groups, like RDA – Regueirão dos Anjos or the more informal Seara – Centro de Apoio Mútuo de Santa Bárbara, gained an even more important role during the pandemic crisis given its social character, following the purpose of “leaving no one behind”.

In this regard, the increasing awareness of how important it is to eat sustainably can be an opportunity to drive the State to ask itself how can the re-engineering of food production be more massively addressed in an inclusive way.

4. WHEN ENVIRONMENTAL AND SOCIAL PUBLIC POLICIES MEET TO FOSTER REGENERATIVE FOOD SYSTEMS

Building upon the unfolded reality discussed earlier and the actions already taken, the main concern of this study is to explore possibilities to foster sustainable fruit and vegetables production along with the policies for the inclusion of low-income Portuguese population in a healthier, but also more sustainable, food consumption path.

To understand the ongoing public measures, the results of the National Programme to the Promotion of Healthy Dietary 2018/2019 were analysed and it is possible to find actions to promote the nutritional and dietary literacy of the Portuguese population, as well as different programmes to tackle unsafe food consumption among particular population segments. In particular, “The right dish” (O prato certo) in the region of Algarve; and the food basket supported by the Fund for European Aid to the Most Deprived (FEAD) Operational Programme (PO APMC).

But when it comes to the promotion of sustainable food consumption, the report only mentions the intention to increase cooperation with the Ministry of Environment, concerning sustainable dietary

and the fight against climate change (Report of the National Programme to the Promotion of Healthy Dietary 2018/2019), and suggests in this same narrow chapter that the first step in the field could be the introduction of recommendations in food procurement notebooks of specifications of public institutions.

Going through the goals of the National Programme to the Promotion of Healthy Dietary to 2020, there is one that stands out: “To increase the number of people that daily consume fruit and vegetables in 5% until 2020”. To implement it, some actions must be taken in order to: “Improve the knowledge about food consumption and nutritional condition of the Portuguese population, its determinants and consequences”; “Inform and build capacity to the acquisition, confection and storage of healthy food items and Mediterranean food principles in general population but specially in school environment and among the most disadvantaged social groups”; “Identify and promote cross-cutting actions that foster the availability and the consumption of good nutritional quality food in an articulated way and integrated with other public and private sectors.” (DGS, 2020).

To ensure the monitoring of this goal, the established indicator - “Percentage of the population that daily consumes fruit and vegetables” - used reference values taken from the Annual National Health Inquiry – 70,8% for the daily fruit consumption and 55,1% for the daily consumption of vegetables and salads (INE, 2015 *in* DGS, 2020).

The focus on incrementing the consumption of fruits and vegetables is clear, but no indicator was found that connects this with environmental requirements.

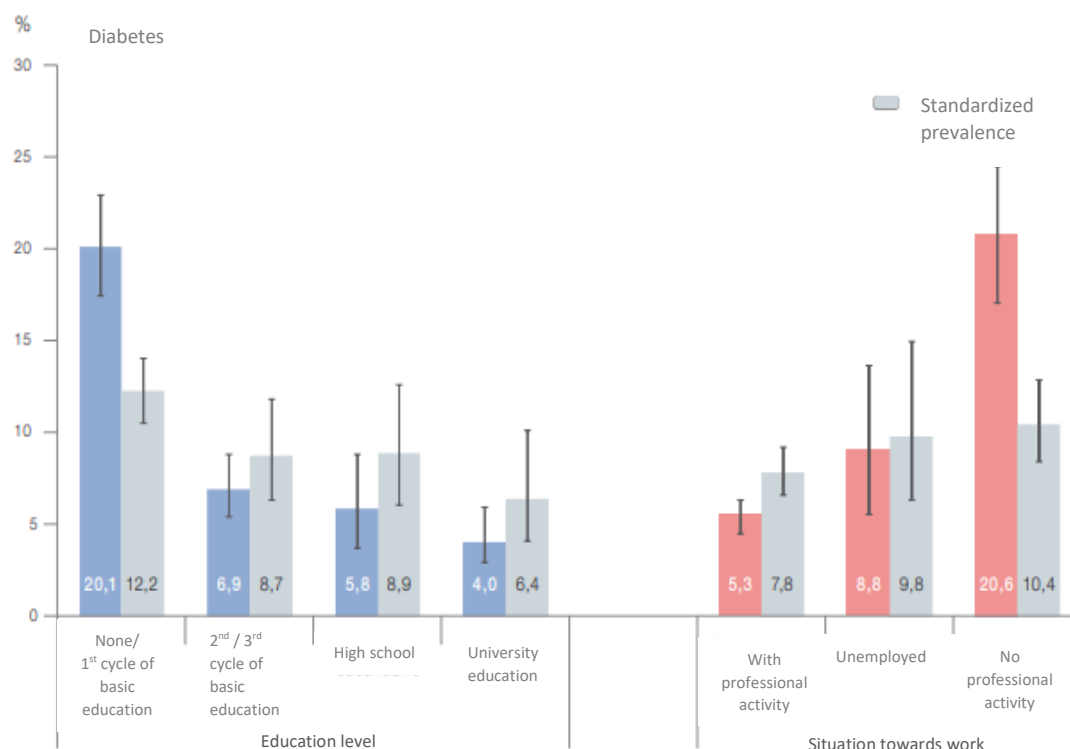
In a broader social policy designed to fight poverty, the Social Integration Income (Rendimento Social de Inserção - RSI), there is also no mention to safeguarding the access to sustainable food consumption among the population living below the poverty line, as one of the aspects of equity to preserve.

5. STARTERS – LOW-INCOME CONSUMERS

The need to broaden the studies about food consumption in Portugal focusing on the low-income population in particular brings out the question of how to gather information about this population, who is often unheard and marginalized from the participatory processes.

The 1st National Health Survey with Physical Examination (INSEF) addressed the health condition of the population residing in Portugal, in 2015, aged between 25 and 74 years old. The results obtained show that the uneducated or poorly educated population and people without professional activity had higher standardized prevalence of hypertension, diabetes, overweight, obesity, abdominal obesity and high blood cholesterol. (Barreto et al., 2016). These data validated the urgency to prioritize interventions in such groups and reinforced the need to better analyse their eating habits.

CHART 1: DISTRIBUTION OF THE PREVALENCE (RAW AND STANDARDIZED FOR SEX AND AGE GROUP) OF DIABETES (HbA1c≥6,5% OR MEDICATION, MEDICATION OR SELF-REPORTING) IN THE POPULATION RESIDING IN PORTUGAL, AGED BETWEEN 25 AND 74 YEARS OLD, IN 2015, ACCORDING TO SCHOOLING LEVEL AND WORK SITUATION

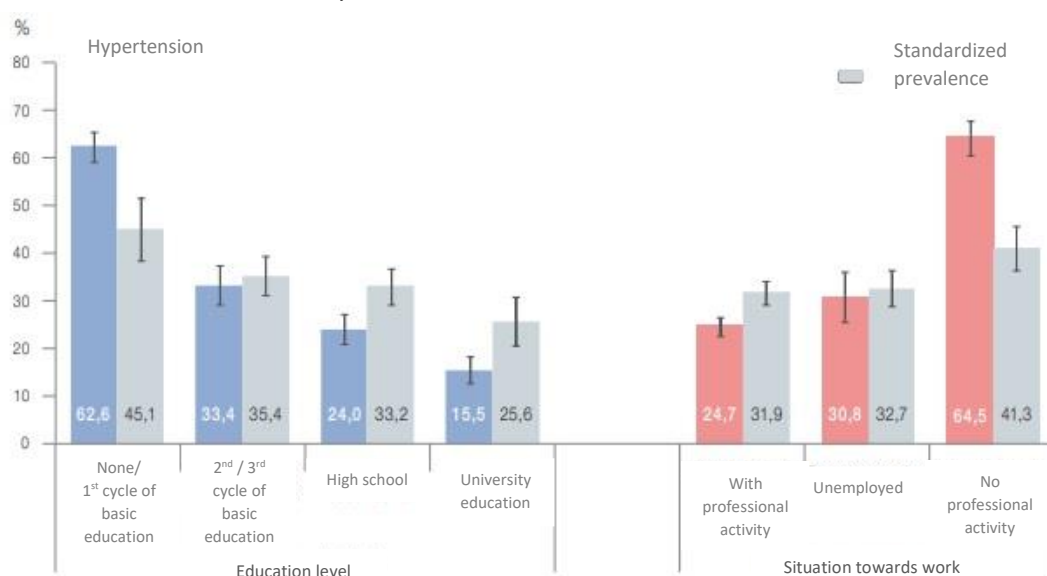


Source: Barreto et al., 2016.

The previous picture shows that prevalence of diabetes varied according to the level of education and the situation at work, being higher in individuals without education or with basic education (20,1%) and in individuals without paid professional activity (20,6%). The lowest prevalence occurred in individuals with higher education (4,0%) and professional activity (5,3%) (Barreto et al., 2016).

Regarding cardiovascular and cerebrovascular diseases, the leading causes of death and disability worldwide, the survey adds that the prevalence of arterial hypertension also varied with the level of education and situation at work (Picture 2), being higher in individuals without education, or with basic education (62,6%), and in individuals without professional activity (64,5%) (Barreto et al., 2016).

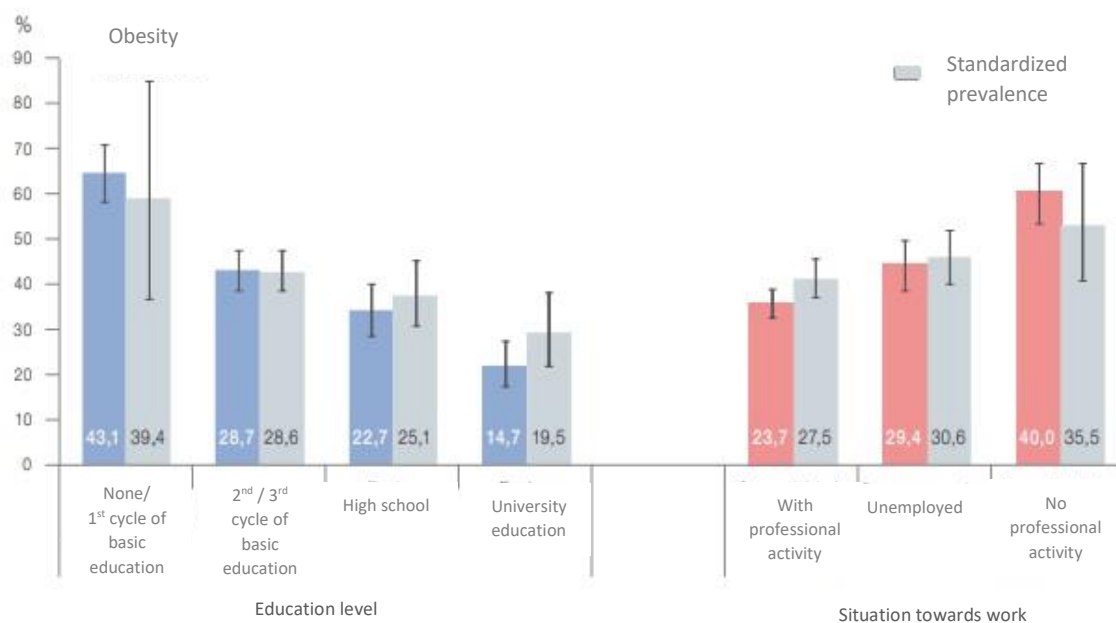
CHART 2: DISTRIBUTION OF PREVALENCE (RAW AND STANDARDIZED FOR SEX AND AGE GROUP) OF HYPERTENSION (TAS \geq 140 OR TAD \geq 90 OR MEDICATION TO DECREASE ED) IN THE POPULATION RESIDING IN PORTUGAL, AGED BETWEEN 25 AND 74 YEARS OLD, IN 2015, BY LEVEL OF EDUCATION AND SITUATION AT WORK



Source: Barreto et al., 2016.

In line with previous results, individuals without any level of education or with only the first cycle of basic education had a higher prevalence of obesity and abdominal obesity.

CHART 3. DISTRIBUTION OF THE PREVALENCE (RAW AND STANDARDIZED FOR SEX AND AGE GROUP) OF OBESITY (BMI \geq 30) IN POPULATION RESIDING IN PORTUGAL, AGED BETWEEN 25 AND 74 YEARS, IN 2015, BY LEVEL OF EDUCATION AND SITUATION AT WORK



Source: Barreto et al., 2016.

The identification of groups with health indicators distributed differently in the population subgroups analysed provides useful information, but in fact this study does not deepen how concretely this is related to the consumption habits of the groups that display the worst health indicators.

According to the recently Nobel awarded Abhijit V. Banerjee and Esther Duflo (2012) “the poor never show up in the story as someone to be consulted about what they think, want, or do, as a source of knowledge, but to progress in terms of policy against poverty we must take enough time to truly understand their lives, in all their richness and complexity”.

These authors point out the relevance of searching for empirical evidence near the populations that are the target of public policies in order to design interventions that are more successful. In their studies, they try to describe the economic lives of the poor based on surveys and research on cognitive and psychological decision-making by poor people.

Acknowledging the existence of biases and heuristics in our thinking can contribute to a better understanding of the sustainable food consumption problem, like acknowledging the schemes that are at stake when people decide what food to buy.

One common cognitive bias that can explain multiple aspects of our lives is the difficulty for all of us humans to overcome the temptation of profiting from the present fruition, without taking into account the adverse consequences it may have in the future (Jackson, 2013). This myopia, the so-called present bias, acts daily against individual, governmental and societal actions to fight climate change around the world. And this is just one of the multiple biases that rule our behaviour, constraining our decisions and sentencing many policies to failure (Ariely, 2008).

When we think about turning the food system into a circular one, using the pressure of consumption to force a more regenerative production, things get even more complex. The strong cultural heritage and habits makes this behaviour even harder to change. The trend to eat green may help, but it is not enough, particularly if we want to include low-income population in this transition.

Adding to the research which concluded that we are cognitive misers and use shortcuts, most of the times, to simplify our choice process (Kahneman 2012), recent behavioural studies point out the existence of particular schemes related with poverty contexts. These results may explain why people facing economic difficulties sometimes behave in a somewhat uncomprehensive way, making choices that will deepen their already critical situation and diminish even more their well-being.

It is now being studied how scarcity can create a singular mindset, whether it is lack of time, or lack of money, and how people suffering from some kind of scarcity are affected in their cognitive function, because a focus on the missing resource causes a tunnelling effect leading them to forget everything else (Mullainathan and Shafir, 2014).

Though some research compares different kinds of scarcity contexts to prove that the effects are similar - for instance the influence on the quality of the parenting role, caused by the lack of time, lack of food, or lack of money to pay the rent - the scarcity that poor people have to deal with is one of the most severe, since they cannot escape from it (Mullainathan and Shafir, 2014).

Considering these facts means to reflect on how strongly inequality can trap the individual and the families, and make their choices non-intelligible to other people or to policy-makers.

One important anchor for this study is to understand how the policies designed to improve food choice habits among the disadvantaged population take into account their consumption behaviour or the insights underlying their decisions when buying food.

6. MAIN DISH – CURRENT POLICY

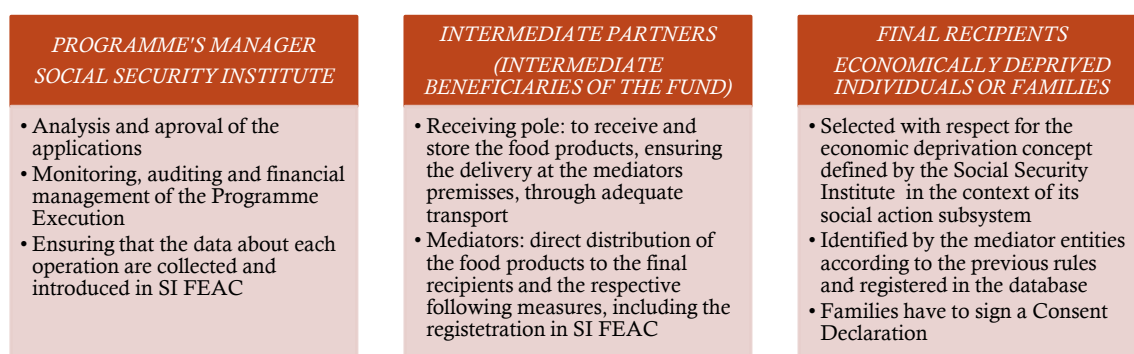
The analysis of the already mentioned distance between food security policies directed to the more deprived and environmental adequacy of the supported items, brought the focus to a policy specifically conceived to answer the problem of inequality in access to quality food: the earlier mentioned food basket held by the Fund for European Aid to the Most Deprived (FEAD) and Operational Programme of Support to the Most Deprived (PO APCM).

The Fund for European Aid to the Most Deprived (FEAD) was created by the Regulation (UE) no. 223/2014 from the European Parliament and Council, and has the specific goal of contributing to poverty mitigation. The non-financial assistance to the most disadvantaged people can consist of a grant-in-aid of food or basic assistance material, or in the development of social inclusion activities to the people under the other referred programmes. This fund supports the national structures that through partner organizations distribute food products to the most disadvantaged people.

In Portugal, FEAD's implementation is carried out by the Operational Programme of Support to the Most Deprived (PO APCM) and is co-financed by the State Budget. The responsible entities are the Ministry of Labour, Solidarity and Social Security and the Ministry of Planning, in accordance with the Ministerial Ordinance no. 217/2019, the 5th altered version of the Ministerial Ordinance no. 190-B/2015.

In this framework the acquisition and distribution of the food products that will integrate the baskets is coordinated by the Social Security Institute (ISS) and the governance of the needed operations is explained in the scheme below.

PICTURE 1: GOVERNANCE MODEL OF THE FOOD BASKET INITIATIVE WITHIN THE SCOPE OF PO APCM



Source: ISS, 2016.

The families' eligibility is communicated through the interoperability between the Programme database, SI FEAC, and the Social Security database, SISS, and this last entity is the final validator according to the current criteria.

PICTURE 2: DELIVERY AND DISTRIBUTION SUPPLY CHAIN OF THE BASKET PRODUCTS



Source: ISS, 2016.

The kind of food products to be distributed was defined by the Directorate-General for Health, as were the quantities to ensure nutritionally adequate baskets, allowing to secure 50% of the beneficiaries' energetics and **nutritional** needs.

PICTURE 3: LIST OF PRODUCTS INCLUDED IN THE BASKET

FOOD BASKET PRODUCTS

Ultra-pasteurized UHT Medium Fat Cow's Milk
Cured Half-Fat Cheese (percentage of fat between 25 and 45%) half a ball
Medium carolino rice
Simple spaghetti type pasta
Breakfast cereals based on corn flakes with high vitamin and mineral content
Cooked red hot canned beans
Canned cooked chickpeas
Chicken frozen in pieces without giblets
Frozen hake no. 3 for portioned cooking
Tuna sliced in vegetable oil in individual cans
Sardines in vegetable oil in individual cans
Canned peeled tomatoes
Vegetable mix for preparing frozen soup without potatoes
Deep-frozen broccoli
Deep-frozen spinach
Olive oil (mixture of refined olive oil with virgin olive oil)
Vegetable Cream
Marmalade

Source: GEP, 2020.

An intermediate following took place to evaluate the satisfaction of the families participating in the programme. The Strategy and Planning Cabinet, in charge of the study, carried out a representative inquiry by questionnaire, in 2018, applied to the final recipients of the food products and the results showed an overall positive evaluation of the initiative, which the recipients considered better than other similar ones.

According to the mentioned study, mediators located in the districts of Aveiro, Porto and Braga (north coast zone) and in Lisbon, Setúbal and Faro (south coast zone) have the largest number of beneficiary households to which distribute food baskets, as shown in the following picture.

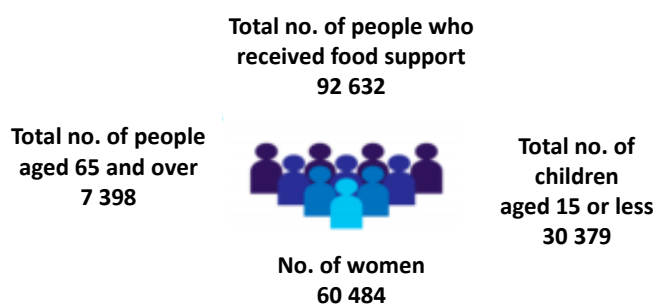
PICTURE 4: NO. OF HOUSEHOLDS COVERED BY MEDIATOR'S

LOCATION IN 2018



Source: GEP, 2020.

PICTURE 5: PROFILE OF RECIPIENTS

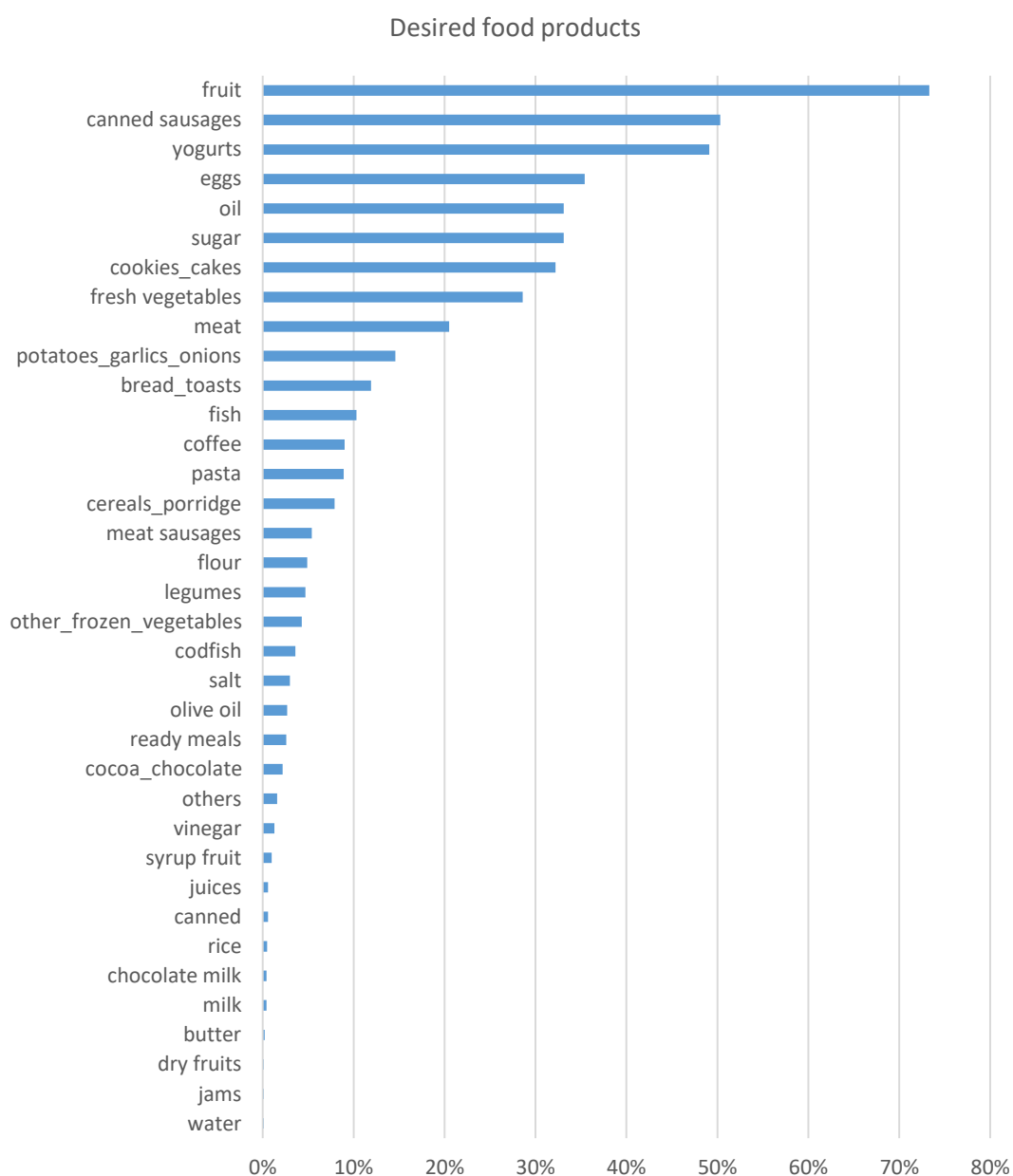


Source: PO APMC, 2019.

Showing some consumer behaviour and preferences, the study allowed some improvements, namely in respect to some products that were not being consumed, or in the families declaring to prefer not to receive such a high quantity of, for instance, spinach and broccoli.

On the other hand, asked to identify new products to add to the basket, several respondents, among other preferences, named fruit and fresh vegetables (GEP presentation Beneficiaries' Opinion distribution of food products and or basic necessities, 2019), as follows:

CHART 4: NEW FOOD PRODUCTS THE FAMILIES WOULD LIKE TO RECEIVE



Source: GEP presentation Beneficiaries' Opinion distribution of food products and or basic necessities, 2019

6. DESSERT – DISCUSSION AND OPPORTUNITIES

Given the above reflection, the following aspects must be taken into consideration in order to understand the successes already achieved by this policy and to build the capacity to capture its failures to enable improvements in the policy design, particularly in searching a positive environmental impact.

- Baskets were nutritionally designed by the Directorate-General for Health relying on careful dietary analysis, with the inputs of national experts and also from the World Health Organization, as can be seen in the manual developed for this purpose “Food Distribution Program: Considerations for the Nutritional Adequacy of Food Supply” (DGS, 2016).
- There are no fresh items in the basket and, as outlined in the above list, all the vegetables are deep-frozen, except for the tomato, which is canned.
- In the delivery chain, the final recipient has no contact with the producer.
- There are no mandatory terms related to the obligation to buy the products locally, or even to buy to national suppliers, but obeying to a centralized procurement procedure offers some freedom to do so, according to the revised actual legislation:

- *Thus, paragraph 2 of article 1º-A of the Public Contracts Code, Decree Law no. 18/2008 states:*

*“Contracting entities must ensure, in the formation and execution of public contracts, that economic operators **respect the applicable rules** in force in social, labour, **environmental** and gender equality matters, resulting from international, European, national or regional law”*

- *And the Resolution of the Council of Ministers no. 38/2016 defines the new National Strategy for Ecological Public Procurement for 2020 (ENCPE 2020):*

“In order to achieve the objectives of ENCPE 2020, contracting entities must include environmental technical specifications or requirements for the selection and qualification of suppliers, in the parts of the pre-contractual procedures, ensuring their implementation in the subsequent phase of contractual execution. Whenever possible, they should also define environmental criteria as an evaluation factor for the most economically advantageous proposal, in procurement procedures involving priority goods and services. In addition to this aspect, products with less environmental impact should be decisive as a tiebreaker criterion.”

“The environmental criteria to be included in the acquisition of goods and services considered as priorities must be defined taking into account the essential principles of public procurement, the state of the art of knowledge, the objectives established in strategic reference documents and the specific conditions / characteristics of the National market.”

“As previously mentioned, the association of environmental criteria with the selection of goods and services is essential for the development of an adequate and effective ENCPE. Thus, the definition of environmental criteria, by product category and priority service, should be carried out using the best information available and a sustained analysis of the market, taking into account the potential environmental impact of the product or service in question and the respective cycle of as well as its budgetary impact. In view of the list of priority goods and services presented in paragraph 4.1, the definition of environmental criteria must be designed also based on the criteria proposed by the European Commission, adapting them, whenever possible, to the national reality. This adaptation is promoted by the working groups referred to in paragraph 6.2.1 and in the framework of specific multidisciplinary working groups, to be constituted for this purpose, depending on the priority good or service.”

- The main objective of the programme, the alleviation of the most serious forms of poverty, providing non-financial assistance to the most deprived people through the granting of food baskets, and the realization of activities aimed at their social integration, seems to be successfully carried out, as shown by the ulterior mentioned reports.
- Regarding the financing made by FEAC, it includes the purchase, storage and transport of food, to be distributed to the most deprived people and families. The Operational Programme (PO), in addition to food support, has also support measures to promote

autonomy, accountability and qualification of the most disadvantaged people, in order to reduce their difficulties and contribute to their social inclusion. In this sense, it complements other national provisions as the Social Canteens Program and cash benefits of an occasional nature, attributed within the scope of the social action provided by the Social Security system.

- As mentioned before, in respect to the baskets' composition, the same goals could be achieved smartly, readdressing the associated environmental impacts.
- There is a major concern linked with the fact that the basket doesn't provide fresh vegetables, since all its items are deep-frozen. The cumulative negative impacts of using plastic in the package, the electric energy needed for the cooling and the transport associated CO2 emissions must be multiplied by 25 thousand families - 65 thousand beneficiaries that receive one basket once a month (total in June 2018, GEP 2019).
- The second identified flaw represents a negative impact, but also the loss of opportunity to create a positive impact, and it has to do with the absence of rules to privilege local producers as providers of the food products. On the contrary, the design of the programme, which consists in centralizing the acquisition of each food item in one contracting entity, increases the distance between producer and consumer, reinforcing a long supply chain with all the associated environmental costs on the way. This also means that the local businesses of sustainable vegetable production around the country are not benefiting from the stimulus that a significant investment in the re-establishment of these local markets could represent.
- On the other hand, going through the Public Contracts Code and even through the National Strategy for Ecological Public Procurement for 2020, it becomes clear that for non-mandatory environmental requirements there are no binding public procurement rules imposing environmental criteria in the choice of candidates. This lack of strength in the legislation does not benefit the change in the public procurement priorities, which assign more weight to environmental aspects and less to the financial ones.
- A third opportunity for improvement comes from the fact that, not being able to choose which products to receive, the families cannot substitute the items they will not consume, causing waste of food. As mentioned previously, there are evidences that some vegetables in particular are among these non-wanted products. On the other hand, it may be argued that this rigidity will not give information about consumption habits, nor empower the families in making decisions about the food that better suits their preferences, and also their health. The introduction of more flexibility in subsequent phases of the programme would contribute to the continuity of the present efforts, beyond the scope of the programme.

Some questions arise when thinking about ways to capitalize an environmental value from these food baskets:

- How can the promotion of sustainable food consumption among the most deprived also have a positive impact in the development of sustainable vegetable production?
- What kind of changes in this programme can foster the low-income population's awareness about their own role in the consumption of more sustainable food?
- What changes in the policy design could give the recipients of the baskets more freedom to choose which vegetables they prefer to consume?

7. INTERVIEWS - ALTERNATIVE PRACTICES

In order to shed light on the previous questions, some interviews were carried out, exploring alternative modes of governance in food distribution. The main points of these conversations were then synthesized.

7.1. Interview 1 – Project “The right dish” (O Prato Certo)

Contact: Project coordinator - Artur Gregório (Algarve)

The team carried out a monitoring survey in Algarve during the previous economic crisis to understand the main causes of food insecurity. The conclusions were that the most critical factor was environmental education, which is why this dimension presided over the design of the pilot project “The right dish”.

Currently, starting from this first survey, a platform is being developed to ensure the continuous monitoring of food insecurity in a massive way, and which is to be filled by entities that are working **throughout** the country on these issues.

The tool in question allows to evaluate the problem and the impact of the solutions, facilitating the evaluation of the sector's policies.

Components of the project “The right dish”

- Food education package for beneficiaries and entities: People still have in their cultural matrix the basic principles of a tasty, healthy and economical diet. What is needed is to support people to make informed, educated food choices, which means that it is necessary to put food back in control of people.

The work of direct education to the population was interrupted during the pandemic, but the work with entities such as municipalities and entities of the social economy that are carrying out food aid programs was intensified. In this regard, they support in the elaboration of menus, but also by distributing a package with training materials for entities and beneficiaries, such as recipes to help with the use of distributed products.

These tools contribute to increase the effectiveness of the baskets, thus mitigating the waste of unused products. On the other hand, it makes eating less monotonous.

In their approach, they defend the principle of sustainability based on a Mediterranean diet.

- Producer database: information on local producers from all over the country available on the projects' website. They started with 60 participating producers and are currently 260.

What is their vision about the possibility of introducing fresh locally produced vegetables in the PO APMC baskets?

- Small local production could and should be almost exclusively absorbed by the social food sector, meaning that social food should not be bought outside the local market, except in the absence of this possibility.
“The priority of public procurement for all social food, I am talking about all public entities - IPSS, PO APMC, canteens, hospitals - should be mandatorily supplied in local production, production in a distance of 30, 40, 50 km, and only the absent products should be acquired out.”
- The Public Procurement Code must be reviewed and a positive differentiation must be given to this kind of contracts.
- Intermediation figures have to be created, because we are talking about micro-producers, who have neither the availability nor time to organize themselves into collectives, groups, or cooperatives. In most cases, the producers are so small that it is crucial to have an intermediate figure to join them. There is a need to invest some resources in creating facilitator figures that can help to aggregate the local offer and to channel it to the social sector.

Positive effects:

- Rejuvenation of small local agro-food production, with the use of expertise and land and also of local productive capacity, keeping the territory functioning;

- The social sector would benefit from better quality food;
- Producers will be able to see their product being valued more fairly than when they sell to large retailers, where the pressure to have a competitive price is very high;
- Representing about 80% of our producers, small producers are currently mainly selling in the neighbourhood markets, because they are unable to compete with a larger scale agro-food industry;
- The bet on rural extension and territorial animation helps to create the link between small production and consumption in the social area.

“This work must be done in a network, with planning, in a cohesive and articulated way.”

“With good planning, we managed to have producers planting what we know school canteens will need in 3 or 4 months. “This is perfectly possible. It has existed in the past and may exist again in the future.”

“It is a win-win situation for everyone.”

What is their vision about the possibility of choosing the basket’s products? What could be the benefits of giving more choice to the target population?

- From Prove’s experience it was clear that people do not have a single way of thinking, there are people who like pre-defined baskets and there are people who do not like pre-defined baskets and prefer to choose certain products.
- The system should make it possible to answer adequately to households that prefer in one way or another, allowing for this flexibility and avoiding a rigid stance that makes people take what is chosen for them.
- But a more flexible system has to be complemented by an adequate training program. Most people no longer know how to use the products and have largely reduced the quantity of products they use, so there is a great monotony. They do not master the basic techniques to make the food healthier and tastier, and have lost that food lexicon that makes food the centre of family life.
- It is necessary to recover dimensions such as education, sociability and the relationship with production, which is fundamental.

Positive effects:

- It allows reducing waste, thus increasing the efficiency of the use of products;
- Welcoming diversity. Having solutions that meet people who prefer pre-determined baskets, whether they know how to use the products because they were educated for this, they already bring the tools with them. Or giving when needed materials that educate to improve the cooking capacity, but still allowing this freedom of choice to ones who prefer.

Relevant notes based on their direct experience with the beneficiaries:

- There are stereotypes on the part of consumers, that healthy eating is not tasty, or is expensive and only for the upper classes.
- There are also prejudices on the part of public entities, for instance, that small production does not have the capacity to react, that it is not possible to organize small producers. The circumstances generated by the pandemic, showed a great capacity for producers’ self-organization, the database with 60 registered producers, suddenly increased to 260 producers. More than 200 producers, who had never used platforms before, faced with the situation, concluded that they either closed, or changed the way they were operating. Most of them did not close, did not give up and started making baskets, home delivering, producing more things.

"I know producers who increased their production by 400% in the confinement period. The small producer has reinvented itself."

- It is necessary to eliminate the prejudice that these small producers, because they are not very sophisticated or organized, because they are few and do not have large structures, they do not have the capacity to respond. They showed that the small production capacity is there, exists and can be a viable alternative, at least for the social economy.

"These changes could improve the quality of the distributed food, contribute to increase the income of small producers and improve the sustainability of the territory."

- There is a price related challenge - the food thus distributed will be more expensive, but much better. It has a much better value for money. It has to do with the formulation of the price; we cannot externalize what are social costs, environmental costs, health costs and focus only on the cost of final sale. We have to integrate all these costs and compare them, and then we will conclude that the products are not that different, and the solutions are not that different in terms of costs. The savings on health care, resulting from food problems, the decrease of the number of unemployment benefits in the agriculture sector, etc., must be taken into account and will improve the entire social and economic ecosystem based on these options. There are clearly numerous advantages in terms of balancing the territory.
- There are also difficulties in finding the right partners. Having launched invitations to gather social investors to the new phase of "The right dish", only an organic food company and a producer and trader of bio foods wanted to join. This means that it is easier to bring to these projects people for whom these principles are clearly in their economic matrix, that have built a business model based on these principles. "The two social investors are much smaller than any of the big ones we have invited, for them the effort to participate is much higher, but the big industry is not interested in this." All catering companies were invited, but did not accept.

"It is necessary to educate companies, one of our target audiences are companies, to educate customers and educate employees. Effectively only these small companies have joined, but we have to start somewhere."

7.2. Interview 2 – Mula Association

Contact: André Carapinha (Barreiro)

This association combines social and civic intervention through the creation of an alternative economy that allows to establish fairer conditions of exchange, both for the producer and the consumer, but at the same time aims to emancipate the people who belong to the Mula collective.

Their following practices can be relevant for the study at stake:

- Vegetable garden that they share with the associates;
- Distribution of food baskets during the pandemic crisis with some monetary support from private donators, but also with the support of the city council;
- A store that brings together local producers;
- Diverse cultural and educational activities.

A vision about participating in the change for the introduction of fresh locally produced vegetables in the baskets.

- Showed interest in being partners of this kind of initiatives, as it is in line with their purposes;
- They consider that the previous experience acquired in working with the community can be useful in a project of this kind;
- The network they are creating between local producers could be used and enlarged to answer the project's needs.

7.3. Interview 3 - Minga Cooperative

Contact: Jorge Gonçalves (Montemor-o-Novo)

In 2013, in order to prepare their work in the community of Montemor-o-Novo, this group carried out a mapping of local production, identifying farmers' problems and the costs associated with microproduction.

In addition to other activities carried out to satisfy the several dimensions covered by this integral cooperative, the following practices seem to be the most relevant to this study:

- They currently sell their associates' products on the local market and in their store. The products in question are vegetables, bread, but also handicraft products;
- Supply of public canteens - They started by supplying a small local canteen (one day a week) and currently enlarged their work, supplying another main canteen (twice a month);
- Work with local farmers to facilitate administrative and accounting tasks associated with their sales.

A vision about participating in the change for the introduction of fresh locally produced vegetables in the baskets.

- There is an agreement that the proposed change would benefit the beneficiaries, but also the local market. They have interest in participating in an eventual pilot project;
- They already have a network of producers that supply local entities. This starting point could be used and expanded to reply to the project's needs;
- They work with 12 local producers, but one of the difficulties is the scarcity of local production. They underline that the decision makers must address some challenges: "It is important to have particular measures to stimulate simultaneously the increase in local production".

8. OPTIONS FOR A SYSTEMIC POLICY

Following the previous discussion, two main alternatives emerged as possible developments to the programme under analysis- PO APMC baskets.

A - External locus of control for eating – The state centralizes and chooses.

This option proposes to keep the food items' acquisition centralized, but by introducing changes in the legislation to create binding environmental criteria and enabling the choice for fresh and the most sustainable vegetables and fruits. In line with the recommendations of the Integrated Strategy to the Promotion of a Healthy Dietary (EIPAS) r: "encourage public procurement of food items to use short chains, organic or integrated means of production". This redesign could follow the requirements already established for the public canteens for which the food supply must mandatorily weigh quality, origin, and environmental impact in the terms previously mentioned. This option could be an effective answer to the presented problems, of long supply chains and high impact frozen vegetables.

Even though this would address the question of buying local fresh vegetables, accelerating sustainable production and promoting equity in the transition to a more sustainable food consumption, the implementation would bring challenges to the institutional capacity. The structure is partially installed, but the dispersion needed to accomplish the goals of this new design is somehow in conflict with the efficiency gains in centralizing. Having to multiply the vegetables' acquisition procedures, which consist of one for each food item, for each sub-region, would possibly bring administrative burden and complexity to the logistics, with increased risks of having incomplete baskets.

This solution is also not particularly concerned with the target's engagement and "bringing closer the producer and the consumer" as recommended in EIPAs.

As for political acceptance, while keeping most of the structure intact, and integrating the new partners (local producers) in an already working system, is an easier change for the administration, the difficulty may be to justify why this shift from the financial and budgetary focus implies such an increase in the administrative burden in centralized public procurement.

B - Internal locus of control for eating – Alliances with communities of consumers and producers.

Apparently seeming more disruptive, the option for the promotion of alliances between the Administration and consumption communities or producers' associations in order to provide fresh and local vegetables to the baskets, in each sub-region, has already been pioneered by some national projects.

The school feeding sustainability programme in Torres Vedras counts with the local authorities support to: the acquisition of local products; work with producers on environmental issues, preferably producers who deliver in bulk or use reusable packaging and products from organic production or integrated protection; teach the children where their food comes from and how to grow organic vegetable gardens.

The change of paradigm would allow to address environmental goals that are more ambitious and to focus on the recipients' engagement. It would favour close networks between the city and the rural areas; and include the most deprived in a broad social movement to turn the agriculture-food system more sustainable, giving them the opportunity to be closer to the producers and other agents of change.

The difficulty is to decentralize the acquisition of vegetables and fruits, designing from scratch a new governance structure also for the logistics. Building on the similar projects already in the field, what is being proposed is to design a pilot to test the better solutions for creating these proximity networks, without risking the main purpose of the programme, which is to feed the population fringe suffering from more scarcity.

9. CONCLUSIONS

Created to respond to the more pronounced forms of poverty, the food basket held by the Fund for European Aid to the Most Deprived (FEAD) and Operational Programme of Support to the Most Deprived (PO APCM) is recognizably contributing to the objectives of the Europe 2020 Strategy, having certainly impacted the goal of reducing at least 200,000 people in poverty by 2020.

Still, this social purpose can be reinforced with environmental goals in order to mitigate and add value to the public investment at stake.

The particular moment we are going through, caused by the pandemic crisis, implies the adaptation to new ways of living, and leads to a reflection about the important role of the public sector in ensuring our collective well-being. This can favour a shift in the way public funds are being applied, considering a long-term vision that takes into account environmental aspects, combining them in this programme with the social and financial ones.

The preference for an alternative that proposes alliances with communities of consumers and producers has to do with its transformative nature. It would enable the introduction of ecological and local food products in public funded programmes, contributing to the regeneration of complementary networks and allowing the farmers to access a market that has been out of reach, taken by global food markets. This alternative model needs to be developed to be more competitive in terms of costs and availability of players and products. The field research, carried out through interviews, made it possible to get in touch with local experiences that have been developing synergies between food support and environmental preservation, making use of local products. The proposed creation of pilot projects, in partnership with some of these organizations, could facilitate

the transition to a new phase of the PO APMC programme, modifying the nature of the vegetable acquisitions, without risking a nutritionally balanced composition of the baskets.

These are critical times, once the emergence of a crisis related to COVID-19, linked to economic shutdown due to sanitary measures, led to an unprecedented rise in the number of workers absent from work or working reduced hours and an increased number of jobs lost. The nowcasting exercise, recently released by Eurostat, estimates inequalities of COVID impact on labour and income in the EU, predicting that low-income workers are more likely to lose their job or to be on layoffs (Eurostat, 2020).

The duplication of the PO APMC food baskets' beneficiaries, from around 60 000 to 120 000 in July 2021 (Ministry of Labour, Solidarity and Social Security, 2021), reflects indeed the fact that this crisis is affecting particularly households with low incomes, contributing to more inequality and new forms of poverty. This reinforces the urgency to understand that some of the system's fragilities were already there, possibly leading to more questioning of the business as usual, revealing that societies can adapt to new ways of living, when that is considered important. "This situation is conducive to thinking about alternatives to our ways of living, producing, consuming and coexist in these early years of XXI century" (Sousa Santos, 2020).

ACKNOWLEDGMENTS

My thanks to the Calouste Gulbenkian Foundation and its LEAP – Policy Development Initiative, within which the study was developed.

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How to promote sustainable seafood consumption in Portugal? An overview with campaigns as a starting point

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ABSTRACT

Seafood consumption in Portugal is a major challenge given it is the highest in Europe, it does not show a decreasing trend and may have ecological, health and economic consequences. This article presents the results of a survey focused on seafood consumption campaigns developed in Portugal over the last decade. Questionnaires and interviews with key informants were also conducted, which resulted in relevant insights on policy measures implemented so far and alternative approaches to sustainability. Policy failures were analyzed and different policy options were discussed. Thirty different campaigns were identified. Many focused sustainability, but different messages regarding seafood consumption may have caused misunderstandings and confusion among consumers. On the other hand, campaigns claiming for a sustainable consumption do not necessarily present key factors of sustainability and practical advices. Thus, in order to promote the sustainability of seafood consumption, besides better and longer communication campaigns, there is a need for a coherent and strategic approach that also changes seafood supply by policy measures previously discussed in a forum that brings together relevant actors. The idea is to gather representatives from seafood, health, tourism and environment sectors, discuss sustainability drivers and limits, and action towards a more sustainable path.

Keywords: Seafood consumption, campaigns, sustainability, public policy development, Portugal

JEL classification: Q, Q2, Q5, Q21, Q22, Q27, Q28, Q56

RESUMO

O consumo de pescado em Portugal é um grande desafio pois é o mais elevado da Europa, não apresenta uma tendência decrescente e pode ter consequências ecológicas, económicas e para a saúde. Este artigo apresenta os resultados de um estudo centrado nas campanhas sobre consumo de pescado realizadas em Portugal na última década. Para além disso, foram realizados questionários e entrevistas a pessoas-chave que forneceram opiniões relevantes sobre medidas existentes e abordagens alternativas em prol da sustentabilidade. Foram analisadas as falhas das políticas e discutidas três opções de política diferentes. Identificaram-se trinta campanhas diferentes. Muitas focaram a sustentabilidade, mas mensagens diferentes sobre consumo de pescado podem ter causado equívocos e confusão entre os consumidores. Por outro lado, as campanhas que reivindicam um consumo sustentável nem sempre apresentam os fatores-chave de sustentabilidade e conselhos práticos. Assim, para promover a sustentabilidade do consumo de pescado, para além de campanhas de comunicação melhores e mais longas, é necessária uma abordagem estratégica coerente que também altere a oferta de pescado através de medidas de política pública previamente discutidas num fórum que inclua os atores relevantes. A ideia é reunir representantes dos setores do pescado,

saúde, turismo e ambiente, discutir os catalisadores e limites da sustentabilidade e ações para um caminho mais sustentável.

Palavras-chave: Consumo de pescado, campanhas, sustentabilidade, desenvolvimento de políticas públicas, Portugal

Classificação JEL: Q, Q2, Q5, Q21, Q22, Q27, Q28, Q56

1. INTRODUCTION

1.1. Context of the policy problem

Seafood²² consumption has grown steadily in most countries of the world (average rate of about 1,5 percent per year between 1961 and 2015) and has never been higher, rising above a global average of 20 kg/capita in 2015 (FAO, 2018). This global trend is considered problematic by several authors (Smith et al., 2010; HLPE, 2014; Costello et al., 2020), since it puts an increasing pressure on wild stocks²³ and the ecosystems they depend on. In fact, the percentage of stocks fished at biologically unsustainable levels increased from 10 percent in 1974 to 33.1 percent in 2015 (FAO, 2018).

In Portugal, seafood consumption raises sustainability concerns. With an annual apparent consumption of 62 kg/capita in 2007/2009 (Bjørndal et al., 2015) Portugal has the highest seafood consumption rate in Europe and one of the highest in the world. Besides, seafood production has been decreasing, domestic aquaculture is still low (5-8% of seafood production over the last 10 years) (based on official INE statistics) and imports currently support around three quarters of the seafood supply (FAOSTAT, no date), which makes Portugal one of the European Union (EU) countries with the lowest degree of self-sufficiency despite its access to productive waters (Vardakoulis & Bernick, 2016). Thus, investigating the sustainability of seafood consumption in Portugal is a pressing and demanding challenge ecologically, behaviorally and economically in terms of the import/export balance.

In the last decade a lot of interesting initiatives in Portugal focusing seafood consumption were developed by different types of organizations (public, private for-profit and non-governmental). A first identification of seafood consumption campaigns run in Portugal over the last decade shows that 30 different campaigns have been implemented.

Some campaigns have been developed by public organizations of fisheries and health sectors. The former have strategic objectives (Docapesca, 2015) and a political commitment related with seafood consumption²⁴ and the later pursue recommendations from a public program for the promotion of healthy eating (Graça et al., 2018). Also, the public tourism authority and Lisbon tourism association have been organizing for more than 10 years an annual fair to promote seafood²⁵, along with wines and other Portuguese traditional delicacies, an initiative that is rooted in the Tourism Strategy 2027 (TdP, 2017). Finally, the Common Fisheries Policy (CFP) and its implementing regulations in Portugal, is obviously at the cornerstone of the policy framework of seafood consumption.

The development of different types of campaigns, promoted by actors pursuing different aims (along with a lot of single actions, festivals and fairs all over the country), over the last decade may have fueled the confusion on consumers willing to make better choices (as found elsewhere by Klein & Ferrari, 2012; Richter & Klöckner, 2017; Farmery et al., 2018). In fact, the seafood consumption trend suggests that such campaigns, interesting they may be, have not been effective enough in terms of sustainability or have not reached enough people. However, such suppositions remain to be demonstrated since the effectiveness of some campaigns has been evaluated (e.g., Docapesca, 2017), but there has not been a critical integrated assessment of such initiatives.

In a brief overview of campaigns developed in Portugal over the last decade, it seems that most focus on the valorization of sustainable and undervalued species, but nutritionally rich and with potential

²² Throughout this study the term “seafood” is used generally to mean all kinds of fisheries and aquaculture products including fish, crustaceans, and molluscs.

²³ Ritchie and Roser (2020).

²⁴ At the Our Ocean Conference 2018 (Bali, 29-30.OCT.2018), Portugal committed to raising awareness of sustainable fish consumption till 2030 (available at: <https://ourocean2018.org/?l=our-ocean-commitments>).

²⁵ “Peixe em Lisboa” (Lisbon Fish and Flavours).

for innovation (e.g., mackerel species). This approach is important in terms of the valorization of seafood products with potential to raise fishermen's revenue and diversify the options of the seafood-processing industry (Docapesca, 2017; Rito, 2019). Nevertheless, though it may have an important role in reducing pressure on over-exploited species, it must be supported by measures that ensure sustainable exploitation levels (Correia, 2016).

Moreover, some initiatives focused on encouraging people to eat more seafood as a way of improving health standards, a practice that has been criticized by some authors (e.g., Clonan et al., 2011) that advocate a better alignment of nutrition and sustainability goals. Considering that nutritionists advise an annual per capita seafood consumption of 9,36 kg (based on APN, 2016), such alignment clearly implies a reduction on seafood consumption, a dietary shift that has recently been advocated by the EAT-Lancet Commission (2019)²⁶.

In a global market where seafood may be produced in one place and eaten thousands of kilometers away and given the state of some wild stocks and marine ecosystems, concerns regarding the depletion of seafood species have increased (FAO, 2018; Watson & Tidd, 2018; Costello et al., 2020). Such concerns have led to the development of certification schemes (e.g., Marine Stewardship Council) and communication approaches to seafood sustainability, including consumer guides, recommendation lists and environmental education programs (Jacquet & Pauly, 2007). However, as Schrader and Thøgersen (2011) clearly say, "there is an ongoing debate, whether the context (e.g., the availability and attractiveness of consumption alternatives and information) or individual values, attitudes, and motives is more important for a behavioral shift towards sustainability".

Changing food systems at a global scale is essential for sustainable development, given current climate and environmental impacts of food production and consumption (Santos et al., 2013; EAT-Lancet Commission, 2019; IGS, 2019; UNEP, 2021). Considering the significant contribution of seafood to food security and nutrition at a global scale (HLPE, 2014; Béné et al., 2015), the important role of seafood consumption campaigns in changing efforts (Jacquet & Pauly, 2007) and the willingness of several actors to develop them, it is critical to look deep into public policy measures, and particularly into seafood consumption initiatives developed so far in Portugal and assess whether there is a need for change.

1.2. Purpose

This article proposes to critically evaluate the seafood consumption campaigns developed in Portugal over the last decade, identify potential alternative evidence-informed solutions of public policy regarding seafood consumption and assess their possible effects.

In order to discuss the topic of how to promote sustainable seafood consumption in Portugal, this research considered the following questions:

- Have campaigns disseminated different messages regarding seafood consumption which may have caused misunderstanding and confusion among Portuguese consumers?
- Have seafood consumption campaigns in Portugal contributed to promote more sustainable patterns?
- Can campaigns promote sustainable seafood consumption?

1.3. Methodology and limitations

This research used four main methods of collecting information, following literature on qualitative research (Hatch, 2002; Bell, 2005): literature review, data collection, questionnaires and semi-structured interviews.

The literature analysis targeted secondary sources on seafood consumption, fisheries history and management, including previous studies, reports, policies at national and international level.

Data collection techniques to gather primary data have been inspired by similar studies (PAU Education, 2014; EUMOFA, 2017). This included the collection of online data on seafood consumption campaigns developed in Portugal over the last decade. For the purpose of this study the term "campaign" has been defined as a series of planned actions intended to achieve a particular result and/or a particular social, commercial or political aim related with seafood consumption

²⁶ The EAT-Lancet Commission recently established an annual intake from fish of 10,22 kg (28 g/day) as a scientific target for a planetary health diet.

(adapted from the Oxford Learners Dictionary). Based on this definition, the identification process discriminated campaigns that have been initiated until June 2019, included more than one action and a clear aim related with seafood consumption.

The campaigns' survey also included the selection of five campaigns as different as possible in terms of type of organizer, timeframe, geographical scope and objectives. Information from questionnaires and semi-structured interviews with five selected campaigns' organizers was collected and analyzed. Materials, including leaflets, booklets, guides, posters and a manual, were also selected and analyzed.

Additionally, questionnaires and interviews with 12 key-informants from different sectors (researchers, public administrators, policy advisors, influencers and businesspeople) have been developed as part of a strategic survey approach.

A number of limitations may have influenced results and conclusions. Firstly, the study relies on online searches, which may have resulted in a limited perception of campaigns run over the last decade, as some may have had almost no digital contents and dissemination, or because actions were not reported or not recorded in photos/videos. Additionally, some key experts in the seafood and health sectors previously identified for the strategic survey were not able to cooperate with the research.

Finally, policy evaluation has been supported by a framework of analysis methodologically based on Young and Quinn (2002). Policies that currently frame seafood consumption have been analyzed and policy failures have been identified. Three policy options have been described and assessed. The evaluation used a set of previously defined criteria, a SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis and an analysis of stakeholder involvement.

2. CURRENT POLICIES INFLUENCING SEAFOOD CONSUMPTION IN PORTUGAL

In order to better understand the phenomenon, current public policies that frame seafood consumption in Portugal were analyzed:

2.1. Fisheries policies

Fisheries policy in Portugal is implemented within the framework of the Common Fisheries Policy (CFP). Supplementary national legislation includes the regulatory framework for fishing and marine cultures in Portuguese waters²⁷ and the fisheries legislation for non-maritime inland waters²⁸.

CFP establishes a set of rules to manage European fishing fleets and commercial fish stocks. Its overarching goal is fisheries sustainability (EC, 2010), i.e., securing fish productivity over the long term and equal access for European fishing fleets to EU waters and fishing grounds (EC, 2010). Its most important sustainability-driven measures include reduce fishing, end discards, regionalize fisheries management and increasing attention to fisheries' "external dimension" (Pauly, 2019). However, CFP also has serious loopholes, particularly government subsidies to fisheries, which contribute to overcapacity and do not promote more innovative sustainable approaches (Bueno-Pardo et al., 2017; Pauly, 2019; Skerritt et al., 2020).

Moreover, the Operational Programme for the Sea 2020 prioritizes the improvement of scientific knowledge, data collection and management, and the support to monitoring, control and enforcement (EC, 2014). However, the number of fish stocks assessed each year has not increased (INE, 2020) and is still far from an adequate coverage of relevant commercial stocks²⁹. Additionally, total allowable catches (TACs) have frequently been set above scientific advice and increased by an average of 36% annually since the European discard ban has been introduced in 2015, despite a general lack of compliance with the landing obligation and widespread illegal and unrecorded discarding (Borges, 2020). In face of this scenario, the exploitation of wild stocks of seafood should be subject to a precautionary approach and more effective control.

²⁷ Decree-Law No. 278/87, published 07/07, and subsidiary legislation.

²⁸ Law No.7/2008, published 15/02, Decree-Law No. 112/2017, published 06/09 September, and subsidiary legislation.

²⁹ Portugal's monitoring efforts of fish stocks within biologically sustainable levels is currently achieved with three proxy sub-indicators, defined in accordance with stocks' data availability (INE, 2020). The 2019 report shows that just a few of the stocks caught in Portuguese waters are assessed (13 in 2019), some of the most important seafood stocks are not assessed (Atlantic chub mackerel, European anchovy and octopus), some of those that are assessed are unsustainably explored (e.g., hake) and one is even over-exploited (sardine).

2.2. Health policies

The Integrated Strategy for the Promotion of Healthy Eating³⁰ (Estratégia Integrada para a Promoção da Alimentação Saudável-EIPAS) provides a policy framework for food consumption in Portugal. One of its strategic intervention areas is to promote consumer literacy for healthy food choices, which prioritizes the promotion of the Mediterranean diet with the traditional Portuguese emphasis on seafood. EIPAS entails several challenges: “obtaining quality information for decision-making”, communicating in an era of social networks and “integrating environmental sustainability and culture” (Graça et al., 2018). As an example of how EIPAS is tackling sustainability issues, Graça et al. (2018) mentioned the ongoing development of guidance for public food procurements to increase the use of organic food in public canteens, but nothing is reported in terms of promoting seafood sustainability.

Indeed, the riddle seems to lie in the right way to promote the sustainability of seafood consumption. It does not seem adequate to merely promote the consumption of seafood without mentioning the need to consume moderate portions or to draw attention to sustainability criteria such as size, origin or fishing gear. The promotion of sustainable seafood consumption clearly demands more integrated work between health, environment and other public policy areas. As the United Nations Food and Agriculture Organization (FAO) and the World Health Organization (WHO) have recently noticed public health policy regarding seafood consumption needs to consider both adverse and beneficial health effects (FAO & WHO, 2019). Yet, considering risks and benefits is not enough. Public health policy must widen its focus and also consider the sustainability effects of recommended foods.

Though the Directorate-General for Health (DGS) still defends the “healthy food” approach, instead of the “sustainable food” already advocated by FAO, there are some signs of change particularly regarding the adoption of the Mediterranean diet as the role model. Some interesting examples of an integrated approach to food issues have been found, not only in the collaborative approach assembled for preparing EIPAS (involving the Finance, Internal Affairs, Education, Health, Economy, Agriculture, and Sea Ministries), but also in the campaign “Receitas com enlatados” (Can recipes) organized by DGS and the Portuguese Institute for Sea and Atmosphere (IPMA) (Sousa et al., 2015).

2.3. Tourism policies

The tourism policy regarding the promotion of Portuguese products, traditions and gastronomy for domestic/foreign markets, and the promotion of Portugal as a foreign investment and tourism destination, is also relevant in framing seafood consumption. Indeed, some relevant lines of action identified in the Tourism Strategy 2027³¹ include to value endogenous regional products (e.g., gastronomy), value sea products associated with the Mediterranean Diet and reinforce tourism in the sea economy (TdP, 2017). However, tourism policy commits to sustainability targets but does not include the sustainability of touristic products, like seafood, which allows for messages and initiatives that are not aligned with the need to promote a more sustainable seafood consumption.

2.4. Sustainability policies

The 2030 Agenda for Sustainable Development, adopted by the United Nations (UN) in 2015, assumes that seafood plays a crucial role in food security at a global scale and, consequently, the fisheries sector has a great responsibility in meeting Sustainable Development Goal (SDG) 2: End hunger, achieve food security and improved nutrition and promote sustainable food production (UNGA, 2015). The big challenge is to achieve SDG 2 through sustainable fisheries and practices as envisaged in SDG 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development.

Significantly, Portugal embraced the 2030 Agenda and has taken a leading role in the implementation of SDG 14 (DGPM, n.d.). In 2017, Portugal presented the first National Voluntary Review on the implementation of the 2030 Agenda (Cabaço et al., 2017). Portugal is also committed to European sustainability policies, namely the European Green Deal (EC, 2019) and the European Farm to Fork Strategy (EC, 2020).

³⁰ Order No. 11418/2017, published 29/12.

³¹ Council of Ministers Resolution No. 134/2017, published 27/09.

The National Strategy for Sustainable Development³² (Estratégia Nacional de Desenvolvimento Sustentável-ENDS) provides a general framework for sustainable food consumption in Portugal, but it does not approach this issue specifically and it is not clear whether it has been evaluated over the last years. This situation has enabled sectoral policies to thrive with scarce coordination, a lack of discussion over sustainability drivers and hindered a clear political support and guidance to the promotion of a more sustainable food consumption.

In short, seafood consumption has not been directly addressed by a public policy. On the contrary, it is vaguely or indirectly addressed by fisheries, health and tourism, which have different and possibly conflicting objectives regarding seafood consumption and have not been articulated under a sustainability umbrella.

3. SEAFOOD CONSUMPTION CAMPAIGNS' ANALYSIS

Thirty different campaigns developed in Portugal over the last decade were identified and characterized³³. A high diversity of organizers was found, including public organizations, associations (from fisheries, industry, science, health and tourism sectors), non-governmental organizations (NGOs), private and state-owned companies.

The aims of these campaigns are also diverse. Most aim either to promote the consumption of specific species/products (e.g., Atlantic chub mackerel, Atlantic horse mackerel, cod) under an overarching goal of seafood valorization (12 out of 30 campaigns), or to promote the sustainability of seafood consumption (12/30). Five other campaigns aimed at disseminating the health benefits of seafood consumption, and only one was triggered by an interest to promote culinary tourism.

The genres of seafood campaigns are wide and there is much diversity, which might confuse consumers. For example, there are campaigns with different structures, duration, type of activities, messages, language, etc.

The data analysis revealed that campaigns embody the organizers' interests and values. In some cases, this relation is direct like in the case of associations from the fisheries sector (e.g., Seafood Row, ACOPE-Fish Traders Association, AIB-Cod Industrialists Association) that promote seafood valorization or environmental NGOs that advocate for seafood consumption sustainability (e.g., Greenpeace, ANP/WWF-Portuguese Nature Association and World Wildlife Fund).

An overview of campaigns disclosed an alignment between these initiatives and public policies from different policy areas (fisheries, health, tourism and sustainability). A wide diversity of actions was found: creation of websites, distribution of communication materials (e.g., leaflets/booklets, posters/billboards, guides, didactic materials/games, videos), organization of events (e.g., classroom/outdoor activities, conferences/workshops, exhibitions, festivals/fairs, showcooking), dissemination of campaigns in mass media (e.g., press releases, interviews, TV/radio and ATM spots) and social media (e.g., newsletters, posts, podcasts).

Selected seafood consumption campaigns (and organizers) are identified below:

- "Campanha da cavala" (Atlantic chub mackerel campaign) (Docapesca);
- Fish Forward (ANP/WWF);
- "Pescado controlado" (Controlled Seafood) (*Fileira do Pescado*; Seafood Row);
- "Rota do peixe português, o melhor do mundo" (Portuguese fish route, the best in the world) (APTECE-Portuguese Association of Culinary Tourism and Economy); and
- *Turma Imbatível – Alimenta o Amanhã* (Unbeatable Class – Feed the Tomorrow) (Lidl Portugal).

Results from the analysis of 15 materials from the selected campaigns show that a wide variety of significant words are used to talk about seafood consumption. The most frequent words were product (14/15), consumption (12/15) and fish (12/15). Significantly, words such as stock, security and vulnerability were scarcely used. Materials of the two campaigns aiming sustainability (Fish Forward and Unbeatable Class) show words regarding sustainability key factors, such as origin, size, diversity, certification, season, vulnerability and fishing gear.

³² Council of Ministers Resolution No. 109/2007, published 20/08.

³³ The identification and characterization of seafood consumption campaigns is presented in the full policy study.

The communication challenge inherent to seafood consumption campaigns is intrinsically linked with the difficulty of changing behaviors. This has been mentioned by some interviewees as the major challenge in what concerns promoting sustainable seafood consumption. That is why some campaigns have targeted small children who are keener to apprehend new concepts and behaviors. Indeed, almost 1/3 of the campaigns (9/30) developed communication actions with school children. Interestingly, while the two selected campaigns that aimed sustainability developed actions with schools, the two campaigns aiming at seafood valorization targeted hotel schools (among others) and the campaign on culinary tourism addressed restaurants.

The Mediterranean diet considered sustainable by FAO and WHO (2019) advocates a more frequent consumption of seafood compared with a low, less frequent consumption of red meat. This is clearly aligned with Portuguese nutritionists' advice of eating small portions of seafood twice a week (APN, 2016). However, the message in campaigns is often simplified as "consume more fish", as appears to be the case with the campaigns "Atlantic chub mackerel", "Controlled Seafood" and "Portuguese Fish Route". In fact, these campaigns also had a secondary or tertiary goal related with sustainability, but the analysis of communication materials revealed that though this word is used widely (in 11 out of 15 materials), key factors of sustainability are not used as much (seafood size – 8/15; diversity – 7/15; fishing gear – 7/15; seafood origin – 5/15; season – 3/15; reduction – 2/15; portion – 2/15; vulnerability – 2/15), which might result in dubious messages.

Table 1 shows the most important results of the campaigns' survey, i.e., campaigns' characteristics, communication channels, results, contribution to sustainability and main lessons. Policy failures and policy solutions indicated by the selected campaigns' organizers are also presented.

TABLE 1: SYNTHESIS OF RESULTS FROM CAMPAIGNS' SURVEY

<i>Synthesis of results from campaigns' survey</i>	
Characteristics of the campaigns	At least 30 diverse campaigns on seafood consumption developed in Portugal over the last decade; Campaigns organized by a diversity of entities (public organizations, associations, NGOs, private, state-owned companies), with different aims and motivated by different values and interests; 12 campaigns focused on seafood valorization, 12 on sustainability, 5 on health and 1 on tourism; , While campaigns targeting seafood valorization have been consistently implemented since 2008, campaigns focusing sustainability have only increased since 2015; Campaigns' communication approaches are diverse and depend significantly on their own contexts, interests and perspectives on their role and purpose in the process of creating change; 9 out of 30 campaigns developed activities with school children; Some campaigns (both public and private) aligned with public policies in the fisheries, health, education and tourism sectors; some campaigns from private associations or companies only aligned with their goals/interests;
Communication channels	Website Onsite dissemination (e.g., sale points, restaurants, municipal markets, schools) Mass media (TV, radio, newspapers/magazines) Social media (Facebook, Instagram, LinkedIn) Local media ATM machines Company's communication channels (onsite, door-to-door) Events (e.g., congresses, festivals, fairs)
Results of the campaigns	Wide diversity of messages and communication approaches regarding seafood consumption across the whole country over the last decade; Valorization of some species and products (e.g., undervalued species, canned products); All five studied campaigns reached a lot of consumers (0,38 – 6,4 million), but none of the campaigns' organizers recognize a change in consumption behavior due to their own campaigns;
Contribution to sustainability	Campaigns developed by public entities did not have sustainability as their main objective and did not address sustainability's concept, key factors or advices in campaign materials ¹ ; they were either focused on commercial promotion or health benefits, or both; Campaigns aiming at seafood valorization communicated on sustainability at events, press releases and opinion articles, but their most important message used health benefits as a trigger to promote consumption ("seafood is health");

	<p>Most campaigns motivated by health concerns also disseminated similar messages without raising awareness on sustainability issues; these campaigns' contribution to sustainability is twofold: raising awareness towards undervalued species and disseminating innovative recipes that promote the diversification of seafood consumption²;</p> <p>Sustainability-driven campaigns raised awareness regarding important concepts and key factors and provided practical advice for a more sustainable consumption;</p> <p>Campaigns did not identify feasible indicators to allow the assessment of their effectiveness in the promotion of seafood consumption sustainability; thus, it is impossible to quantify campaigns' contribution to sustainability;</p>
Main lessons	<p>Most effective communication channels: TV, radio, ATM and social media;</p> <p>Campaign's effectiveness seems to depend on its continuity over time³ and the adequacy of the communication approach;</p> <p>Some campaigns did not guarantee coherent messages communicated through different channels (some materials used simple and short messages and disregarded secondary aims, like sustainability);</p> <p>Some campaigns prepared interesting studies/articles that were disseminated through low-impact channels and not reflected in main messages;</p> <p>Constraints included budget, bureaucracy, resistance to behavior change, communication challenges and scarce political support;</p> <p>Assessing campaign's effectiveness is crucial and requires that feasible indicators are identified and measured while defining campaign's aims.</p>
Policy failures	<p>Lack of public discussion on sustainable food consumption;</p> <p>Lack of strategy regarding sustainable food consumption;</p> <p>Scarce coordination between public entities and between public and private entities;</p> <p>Health policies do not promote sustainable diets;</p> <p>Lack of support to industrial seafood processing innovation;</p> <p>Lack of seafood sustainability criteria in public procurement.</p>
Policy solutions	<ul style="list-style-type: none"> - a comprehensive approach to seafood sustainability that joins awareness campaigns with coherent specific measures from relevant sectoral policies (e.g., fisheries, health, fiscal), supported by scientific evidence; - create a working group integrating sectoral policy-makers and relevant stakeholders; - incentives to the development of innovative and "easy-to-eat" products from species captured in Portuguese waters; - support certification processes for nationally produced seafood; - sustainable food consumption recommendations/requirements for public procurements that aim to supply public food services (schools, universities, hospitals, Parliament, etc.); - campaigns aiming at changing seafood consumption habits in children, supported by the implementation of seafood meals made with sustainable species in school canteens (including training for kitchen assistants).
<p>¹ Apart from a campaign of the Regional Government of the Azores.</p> <p>² VT Mar, Marketing Intelligence & Docapesca (2017).</p> <p>³ Average campaign duration: 3 years and 2 months.</p>	

Source: Elaborated by the author.

What seems to reach most people are the simpler messages disseminated by broader communication channels, like TV, radio and social media networks. Indeed, of the selected campaigns, "Controlled Seafood" campaign reached the most people, ca. 6,4 million people, through such channels. Even considering that such figure might be overestimated, it is much higher than the runner-up (Fish Forward, 2,8 million people) and such a difference is probably related with the communication materials and channels chosen: TV, radio, ATM, mupis at 3 international airports and videos on TAP flights.

However, estimated total reach is only one approach to measure campaign's effectiveness. The way people are reached is relevant and that is why some campaigns (e.g., Unbeatable Class) targeted young children with messages/activities that explore principles of ocean sustainability. Of the selected campaigns studied, only the "Atlantic chub mackerel" campaign (2012-2017) has been

subject to an external assessment of its value for chub mackerel's market valorization. It concluded that there was an opportunity to increase its sales, the campaign should be sustained in time and geographically enlarged. Dissemination instruments should go beyond the word-of-mouth and use traditional media (TV and social networks) and campaign's scope should include other species (VT Mar, Marketing Intelligence & Docapesca, 2017). These conclusions have been wisely used by Docapesca in the following "Atlantic horse mackerel is cool" campaign (2018-2020), that was disseminated through TV and ATM spots, billboards and social media, and is aligned with recommendations collected during the strategic survey.

4. IMPROVEMENTS FOR THE CAMPAIGNS AND ALTERNATIVE POLICY MEASURES

Within this research, a strategic survey has also been conducted in order to better understand seafood consumption drivers and trends, the role of campaigns, policy failures and appropriate measures.

One important conclusion is that mixed messages in campaigns may confuse consumers and even undermine their trust in institutions. In what regards seafood consumption in Portugal, results from this study show that a coherent and consistent communication approach is needed, which is generally what literature on the effectiveness of media campaigns also concludes (Noar, 2006; Wakefield et al., 2010).

Indeed, despite the high number and diversity of campaigns run over the last decade, respondents to the strategic survey recalled a maximum of 5 campaigns and all interviewees mentioned Docapesca's "Atlantic chub mackerel campaign", which supports the views of some interviewees regarding the short-lived effects of these initiatives and appeals to continuous communication on seafood sustainability.

Potential improvements for the campaigns might include:

- Securing the continuity of campaigns addressing the sustainability of seafood consumption,
- Comprehensive, more incisive/simple and integrated campaigns,
- Coordination between public and private entities to promote credible and coherent messages,
- Public species-specific campaigns only addressing stocks that are regularly assessed and known as sustainably exploited,
- Solid scientific basis in context characterization, campaigns' design and contents,
- Science communication and marketing techniques, tools and experts to design campaigns' messages and layouts,
- More digital communication, social networks, major magazines/newspapers, TV/radio spots, and
- Assessments of campaigns' effectiveness, cost/benefit balance and potential sustainability impact.

However, most participants on the strategic survey stated that even if campaigns are improved and expanded (as they should), they are not enough to promote a more sustainable seafood consumption (10/12). Such results are aligned with studies/reviews concluding that education or awareness campaigns alone are unlikely to produce food behavior changes (Jacquet & Pauly, 2007; Brambila-Macias et al., 2011; Dolmage et al., 2016; Trieu et al., 2017).

Besides some specific policy failures identified by both respondents from the campaigns' and strategic surveys, results of this study clearly point out to the following major policy failures:

- Scarce coordination between sectoral policy areas and actors;
- Lack of discussion on sustainability obstacles and drivers; and
- Lack of political support or guidance involving all stakeholders.

Table 2 shows a set of potential additional measures identified during the research and insights on their suitability and feasibility provided within the strategic survey.

TABLE 2: SYNTHESIS OF ASSESSMENT OF POTENTIAL POLICY MEASURES

<i>Synthesis of assessment of potential policy measures</i>		
Designation ▼	Justification and description of the measure ▼	Insights from the strategic survey ▼
<i>Lobbying at the EU level for more sustainable seafood imports and consumption policies</i>	Given that Portugal is a member of the EU, it is not wise to establish different standards and requirements at a national scale alone. This measure is justified by the identification of a set of issues that must be addressed at the EU level, particularly seafood imports and consumption policies.	This measure was mentioned spontaneously by some interviewees as the most effective way to address some measures (e.g., seafood products labelling, traceability and imports).
<i>National commission or working group for the promotion of seafood consumption sustainability</i>	Justified by the lack of a strategic approach to the topic. The idea is to establish an intersectorial forum for discussion of policy measures, support to their implementation, monitoring and evaluation. This would also include the design of public seafood consumption campaigns driven by sustainability.	The need to establish a national discussion forum was identified both in the campaigns' and strategic survey. Some respondents clearly identified the advantages of involving relevant stakeholders from the seafood value chain, health and education sectors in the discussion of measures.
<i>Guidelines on how to promote sustainable seafood consumption through campaigns</i>	Justified by the number and diversity of campaigns developed so far, which shows the capacity and willingness of a lot of organizations and a need to converge into a common path of sustainability promotion. Aimed at providing guidelines on how to develop an effective campaign on seafood consumption sustainability, this might include principles, guidance, best practice and case studies.	Most respondents found this measure useful and feasible. Some mentioned it may benefit from a long-term perspective to be developed by interdisciplinary and independent experts, include good examples, tips regarding the adequate type of language, a glossary, an appeal to the standardization of terms and different messages tailored for different regions and target groups, and supported by studies on seafood consumption characteristics, trends and needs.
<i>Official seafood consumption recommendations' guide</i>	Justified by the existence of guides with contradictory recommendations for a few stocks, this measure is meant to provide accurate and updated information, that can be trusted by consumers. The idea is to prepare and regularly update scientifically-sound recommendations by stock.	All respondents found this measure interesting and feasible, though some mentioned it might have a small impact. Some referred it should be prepared by renowned experts from IPMA and other scientific institutions and discussed with different sectors (producers, industry, retailers). Communication experts could also be involved in the final design and dissemination activities (including mass media and partners' networks). The guide should provide accurate information on seafood stocks (contributing to the demystification of the state of some stocks) and it might also include nutritional information and recipes.
<i>Coalition of retailing, HORECA (Hotels, restaurants and catering) and fisheries sectors for seafood sustainability</i>	Justified by the existence of some scattered initiatives from the seafood supply chain and a low involvement and commitment with concrete actions for the promotion of a	Some interviewees showed some doubts on the feasibility of this measure due to little tradition in associative/cooperative dynamics and suggested previous

	<p>more sustainable seafood consumption.</p> <p>Aimed at promoting a change in seafood supply in a constructive and cooperative way, this measure requires the direct involvement of key decision-makers (i.e., the Minister of the Sea) in activities that contribute to the establishment of a new supply dynamics.</p> <p>This might include inviting all stakeholders to adhere to some guiding principles and commit with concrete actions to be implemented within a reasonable deadline (e.g., 3 years), promoting partnerships for the development of innovative products, and the organization of public event(s) (e.g., seminar) to present the results.</p>	<p>meetings with associations from relevant sectors, consumers and NGOs.</p> <p>Some previous work may be done by IPMA, the fisheries authority (Directorate-General for Natural Resources, Safety and Maritime Services - DGRM) and universities to develop a structure with a vision and targets. This might include concrete ideas of commitments that might be put forward and invitations to some players (e.g., a label/trademark for sustainable restaurants, food festivals' organizers invited to reduce seafood waste). Some people suggested it would require incentives (e.g., a contact platform, local certification, label/trademark, prize, annual events).</p>
<i>More stringent requirements on mandatory information and more mandatory information on seafood products labelling</i>	<p>Seafood labels are important because they allow consumers to make responsible choices. Current standards for seafood labelling³⁴ include a group of mandatory information and some additional voluntary information.</p> <p>The idea is to discuss the adequacy of establishing more stringent requirements on mandatory information (e.g., catch area) and more mandatory information (e.g., port and date of landing) on seafood products labelling.</p>	<p>Most respondents mentioned that improving labelling is important and challenging and requires more precise and reliable traceability. Most agreed that mandatory information should be more specific regarding origin (catch area). Some suggested the establishment of a sustainability classification for labels, in alignment with the official recommendations guide, similar to the Nutri-Score (used to decode nutritional information) or with a QR (Quick Response) code. Two respondents suggested a thorough assessment of current system should be performed to understand whether there is a need for change (what and how) or there is only a need for rigorous implementation. Consultation with relevant sectors to avoid double-system or non-compliance situations (some companies already adhered to GS1 standards) could be relevant.</p>
<i>Revision of the seafood imports requests' assessment criteria and procedure</i>	<p>Imports of fishery products into the EU are subject to official certification of non-EU countries and an assessment procedure in each EU Member State.</p> <p>The idea is to assess whether such procedure could benefit from a revision and improvement.</p>	<p>Most interviewees were against this measure since EU has a consistent policy on seafood imports and changing procedures in Portugal might distort the market. Some of them stated that demand pressures will overcome such restrictions by inducing purchases in more permissive countries and that the main problem might be at the origin (in some countries the certificates refer a false origin and there is not enough control). Seafood imports could therefore be subject to international lobbying at the EU level for more control and independent audits to improve the</p>

³⁴ Regulation (EU) No. 1169/2011, of the European Parliament and of the Council.

		reliability of compliance certificates.
<i>Improve seafood traceability system</i>	<p>Traceability is the basis for more transparency and an incentive to law compliance since it aims to track individual items from production till consumption. Improving seafood traceability will enable more accurate data available for fisheries control and law enforcement procedures as well as more reliable information for consumers.</p> <p>The idea is to identify and discuss possible improvements to the seafood traceability system currently in place and assess the challenges of implementing the best option available.</p>	<p>Though two people disagreed with this idea stating traceability is mandatory, well defined in regulations and a matter of law compliance, most interviewees agreed it is important to improve the traceability system, as a way to reduce illegal fishing opportunities and improve consumers' confidence. Modern technologies (e.g., blockchain) may improve the accuracy of information on catch areas, catch date and time, compliance with quotas/rules, etc. Ideally with an electronic catch documentation scheme (eBCD), an individual identity card like the tunas, but that is not possible for all species.</p>
<i>Support for certification of fisheries and aquaculture national products</i>	<p>Certification processes are demanding, time-consuming and costly. Such difficulties may hinder many companies and associations of seafood production and processing industries from trying certification. This measure aims to provide financial and technical support to the certification of fisheries and aquaculture national products. It might also include labelling and marketing initiatives³⁵.</p>	<p>All interviewees agreed with this measure. Some said this will require a lot of public resources and producers' organizations will need more capacity. One interviewee suggested the creation of an EU origin label as a guarantee of compliance with the rules. Some people mentioned Portugal could create a national certification, but one of the interviewees clearly objected.</p>
<i>Guidelines for public food procurement to supply public canteens and catering services with sustainable seafood</i>	<p>Promoting the consumption of sustainable species in public canteens and catering services might contribute to increase awareness and encourage the seafood supply industry.</p> <p>The idea is to prepare guidelines for public procurements for canteens in schools, universities, prisons, courts, health and other public services. Such guidelines might have a wider focus on sustainable food and circular economy principles.</p>	<p>Though two people disagreed because of many existing requirements, complex legal framework, low business margins and difficulties for national producers to support such demand, most interviewees found the idea interesting and challenging in terms of definition, implementation and communication. This would be an opportunity for literacy and innovative fish processing and cooking, and an instrument of public policy towards the valorization of seafood caught in Portuguese waters. Interesting experiences have been developed by ANP/WWF in cooperation with Sesimbra Municipality and by IPMA with the Public Administration Social Services.</p>
<i>Tax rates, incentives and disincentives</i>	<p>Tax rates, incentives and disincentives have already been successfully used in Portugal as tools to promote food behavior change (e.g., sweetened beverages)</p> <p>This measure aims to identify and assess possible fiscal incentives and disincentives to promote sustainable seafood products and discourage unsustainable products,</p>	<p>Most interviewees showed doubts regarding this measure, which might become just another tax or a perverse incentive (inducing false identification of products' origin). It might be difficult to implement, control and assess.</p> <p>However, one interviewee was very enthusiastic, stating that taxes are effective instruments in inducing</p>

³⁵ Inspired in examples in Portugal (e.g., fish baskets) and elsewhere (Gómez & Maynou, 2021).

	respectively.	consumption practices. Another suggested shrimp, lobster and other products could be taxed at the maximum value added tax. Some people showed a preference for positive incentives and education referring that such approaches are more prone to behavior change.
<i>Review/Improvement of the work plans for data collection in the fisheries sector (National Program for Biological Sampling – PNAB)</i>	Collecting biological data on seafood stocks that allows regular assessments and effective management is essential. Currently, only a few seafood stocks are assessed each year and this situation might change if an improvement of the work plans for data collection is performed and approved.	All interviewees agreed that improving data collection is important for fisheries sustainability since it shall provide fisheries managers with better knowledge. Some people mentioned that data collection within PNAB should be improved. Other said it would be useful to assess whether there is a need for improvement and how. One respondent suggested the implementation of integrated data collection plans that promote the creation of a network with universities and research centers that also collect data on stocks (in a similar way to Portfir and Seafood Tomorrow in relation to food nutrition). Another respondent suggested the costs of monitoring should be paid by the fishing sector in a user-pays perspective.
<i>Strengthening the inspection of fisheries and of the marketing of seafood products</i>	Justified by the importance of control and inspection tasks to evaluate compliance with fisheries management measures. Strengthening the inspection of fisheries and of the marketing of seafood products might include more inspectors, more means and greater articulation between authorities.	Though two interviewees said they do not know if a reinforcement of the inspection is necessary, all agreed on the need for more coordination between competent authorities, further training, integrated inspection (first and second sales' auctions, processing and distribution). Two people mentioned the problem of illegal, unreported and unregulated fishing (IUU) fishing ('fuga à lota') saying there is a need for more inspection.
<i>Review of the system of fines and additional penalties</i>	Justified by the relevance of having fines and additional penalties that are discouraging enough so that illegal fishing might be significantly reduced, this measure aims to assess the adequacy of the current system and eventually propose adequate adjustments.	Most respondents said they do not know if a review of fines is needed, but two stated it is not needed because fishery laws are updated and have sufficiently high (deterrent) fines. However, two agreed with this measure, saying that the law should be more stringently applied in what regards mesh sizes, minimum sizes of specimens, banned species, and that suspending the fishing license would be more discouraging of illegal practices. Great complexity and overlapping legal rules that lead to some ambiguity in its application, insufficient care in the instruction of cases and low sensitivity of the magistrates were mentioned as related problems.

Source: Elaborated by the author.

5. POLICY OPTIONS

Portugal faces a major challenge regarding seafood consumption given its high rate and its environmental, health and economic consequences. Facing such a challenge has become increasingly urgent given the consequences of overfishing, the unreasonableness of seafood waste and the threats of climate change (Costello et al., 2020).

Within this research, three different policy options have been considered and analyzed:

- Business as usual (BAU), i.e. baseline policy option – current policy framework and lines of work are maintained as well as financial and human resources capacity;
- Demand-driven policy option – focuses on trying to change seafood consumption patterns by strategically targeting consumers' ability to change; and
- Supply-focused policy option – focuses on changing supply by a diverse set of policy measures in an incremental way in relation to the demand-driven policy option.

These options have been characterized and analyzed according to a set of evaluation criteria and an estimated 6-year timeframe for the implementation of a policy-based solution. The most important results of the evaluation³⁶ are presented in Table 3.

TABLE 3: BUSINESS AS USUAL, DEMAND-DRIVEN AND SUPPLY-FOCUSED POLICY OPTIONS FOR PROMOTING SUSTAINABLE SEAFOOD CONSUMPTION IN PORTUGAL

Criteria ▼	Policy Options		
	Business as usual (BAU) policy option	Demand-driven policy option	Supply-focused policy option
Effectiveness in terms of behavior change	Extremely unlikely	Probable but only in the long run (beyond 10 years)	Possible
Feasibility	High This option does not require the costs and efforts needed to change current policy and is thus highly feasible	Medium This option requires willingness and efforts to adopt different roles and lines of work. Its feasibility is dependent on political acceptance and involvement	Medium Justification as presented for demand-driven
Costs	Low	Low This option will require different roles and lines of work for public stakeholders. This is not expected to have more costs than the BAU option (the available budget may be focused on the new lines of work)	Medium This option will require a new mindset focused on the long-term, different roles and lines of work for public and private stakeholders This is expected to have more costs since most measures will require more financial resources (e.g., traceability technological tools, incentives)
Human resources and technology	Low	Low Justification as presented for costs	Medium Justification as presented for costs
Stakeholders' involvement	Sporadic and ad-hoc involvement or cooperation between stakeholders	Increased cooperation between researchers and fisheries' administrators in the awareness and education programs Sporadic and ad-hoc involvement or cooperation	Long-term involvement through collaborative approaches of different types of stakeholders: - Public organizations and decision-makers from fisheries, health, tourism,

³⁶ A SWOT analysis and an analysis of stakeholder involvement were also performed as a support to options' evaluation. The results of such analyses are presented in the full policy study.

		of other stakeholders	environment, education and economy sectors - Fisheries producers organizations - Private companies and associations (from the retailing, HORECA, seafood processing and aquaculture sectors) -NGOs
Institutional barriers	Low	Medium This option will require different roles and lines of work for several stakeholders (researchers, public administrators, organizations from the fisheries sector) and such demand may be subject to some resistance	High This option will require a new mindset focused on the long-term, different roles and lines of work for several stakeholders, particularly for public administrators, organizations and decision-makers from the fisheries sector, and more cooperation between them, and this may put additional pressures on the institutions
Institutional partnerships	Almost none	Few	Lot
Public acceptability	Reduced	High With a focus on reliable information and consumers' awareness, this option will probably be well accepted by the public	Even higher This option may collect even higher support from the public, given the coherence of the multisectoral approach Conditioning awareness campaigns to a prior assessment of stock sustainability and developing measures to decrease illegal and unsustainable seafood in the market are some of the most important measures in this regard
Valorization of sustainable and undervalued species	++	+++	+++
Seafood consumption trend	---	---	↓
Main messages in public awareness initiatives	Substitution	Diversification	Diversification Innovation Reduction
Illegal seafood selling	Increase	Increase	Decrease

Source: Elaborated by the author.

The recommended option is the supply-focused policy option. This option may have better results in the long-term since it aims changing supply (i.e., the basis of the value chain), it is incremental in relation to the demand-driven policy option and promotes stakeholders' involvement.

Possible measures to promote a change in supply and/or demand (described and assessed in Table 2) might include promoting a business coalition (e.g., producers, retailers, HORECA), improving seafood traceability and labelling, reinforcing the inspection of fisheries and seafood products' marketing,

supporting seafood certification, and improving fisheries data collection. It might also include financial support to industrial innovation in processed seafood and public campaigns for the valorization of sustainable and undervalued species conditioned to a prior assessment of stock sustainability.

This option will require a new mindset focused on the long-term, different roles and lines of work for several stakeholders, particularly for organizations and decision-makers from the seafood sector, which will possibly encounter some institutional barriers. However, given the prospects of a long-term involvement through collaborative approaches, the potential for more innovation and creativity in fisheries, aquaculture and seafood processing industries and a new impetus regarding fisheries law enforcement, thus enhancing equity in the sector, such initial constraints will probably be overcome.

Moreover, this is the only policy option that is expected to result in a change in seafood consumption patterns, contributing to a decrease in seafood waste and illegal seafood selling. This option is aligned with the climate change mitigation and biodiversity conservation agendas, targets all the stakeholders of the seafood value chain (from producers to consumers) and entails the integration of sectoral policies in a multi-disciplinary approach to seafood production and consumption sustainability.

6. CONCLUSION AND RECOMMENDATIONS

This research looks into seafood consumption campaigns developed in Portugal over the last decade and attempts to understand how interesting is their contribution in raising consumers' awareness of the need to make prudent choices when buying seafood and ultimately contributing to change the way fish are exploited. This approach to sustainability is nonetheless doubtful.

Firstly, because if changing consumer behavior is not easy, changing seafood consumer behavior in Portugal is definitely difficult given the traditional gastronomic culture around seafood (Almeida et al., 2015a; Roheim et al., 2018; Madsen & Chkoniya, 2020). Significantly, all five selected campaigns' organizers claimed to have reached a lot of consumers, but most stated that it is not possible to say that there was a change in seafood consumption in response to their own campaigns (4/5).

Also interesting is the fact that all but one selected campaigns' organizers identified a problem with the high consumption of some imported species (cod, salmon, tuna and hake) and recognized the need to diversify seafood consumption. Such a claim is supported by Almeida (et al., 2015b), who found that Portuguese consumers know a lot about seafood but not necessarily about its sustainable consumption and advocates the promotion of existing habits such as diversifying seafood and using small pelagic species.

As many authors have shown, merely providing better information does little to change individual behavior (Jacquet & Pauly, 2007; Wakefield et al., 2010; Brambila-Macias et al., 2011; Dolmage et al., 2016; Trieu et al., 2017), because change requires additional efforts (first in gathering, interpreting and utilizing information; secondly in cooking and tasting new species) and humans tend to weight such costs against potential benefits. Since potential benefits are not directed to the individual but primarily to species and ecosystem conservation, valuing such intangible results requires environmental sensitivity and awareness. Or as Wallen and Daut (2018) put it, behaviour change benefits from an alignment with a pre-existing personal interest.

Secondly, communicating sustainable seafood consumption is not easy. Sustainability is a well-known word, but many different concepts prevail since there has not been a discussion around its limits. Moreover, key factors of sustainability are not easily perceived by consumers and may require explanations and examples, as included in the Fish Forward guide (WWF, 2016).

Thirdly, a change of consumers' behavior, even considering public entities' and enterprises' involvement along with individual consumers' awareness, might take a long time (one or two generations) to reach the desired effects of promoting sustainable seafood consumption.

Thus, as time is running out, it is interesting to consider a policy option that attempts to promote a behavior change on the side of producers/providers (food processing industry, retailers, HORECA sector, and public procurement organizations) and consumers alike, i.e., the supply-focused policy option.

Portugal embraced the 2030 Agenda for Sustainable Development (UNGA, 2015), the European Green Deal (EC, 2019) and the European Farm to Fork Strategy (EC, 2020), among other multilateral

environmental agreements that require action towards sustainability in general and food sustainability in particular. Some of the most relevant commitments/targets in this respect include:

- halving per capita food waste by 2030 (UNGA, 2015);
- developing the potential of sustainable seafood as a source of low-carbon food (EC, 2019);
- fighting IUU fishing and seafood fraud (EC, 2020);
- promoting healthy, affordable and sustainable food for all (EC, 2020);
- reviewing EU marketing standards for fishery and aquaculture products to ensure the uptake and supply of sustainable products (EC, 2020).

At national scale, besides fisheries, health and sustainability policies, Portugal adopted the Carbon Neutrality Roadmap 2050 (RNC2050)³⁷, and the National Ocean Strategy 2030 (DGPM, 2020), which will demand new action on the sustainability of seafood production and consumption.

Thus, the needed change shall be promoted by the government. However, given that fisheries policy is set at the EU level and that the problem is global, the government could consider the relevance of lobbying for more sustainable seafood imports and seafood consumption policies and putting these issues on the agenda. Promoting debates at national, European and global scales in favor of seafood consumption sustainability might be a very important step towards the solution.

Finally, a change from a pure “economicist” mindset to one that considers the natural capital and ecosystem services, which requires valuing every discard, by-product and seafood waste, could be a relevant policy improvement. Involving all stakeholders of the seafood value chain in broader discussions on how to promote seafood sustainability might result in the creation of innovative solutions to resolve the riddle of valuing marine resources and marine ecosystems’ services.

In short, just a few campaigns developed in Portugal over the last decade aimed to promote sustainability (most aimed at seafood valorization and health improvement), but in fact there is not a public policy or political message regarding the importance of promoting sustainable seafood consumption in Portugal. As such, though a possible increasing seafood cost might induce a slight slowdown in consumption, it is highly unlikely that seafood consumption will change much, or rates will drop, unless a different approach is adopted. As shown, all the efforts of public and private campaigns to encourage the consumption of sustainable species are probably not enough to change seafood consumption, particularly if they are not interconnected by a common approach.

6.1. A new policy approach

The policy option recommended in this study addresses the need to change demand patterns and preferences, by improving campaigns’ effectiveness, while focusing the greatest efforts in adjusting seafood supply by a diverse set of policy measures. This option is based on a constructive and cooperative partnership approach, involving all stakeholders of the seafood value chain (from fishermen to consumers), public institutions, academia and civil society.

The idea is to set a discussion forum that gathers relevant players from seafood, health, tourism and environment sectors. Discussions could address sustainability drivers and limits, and needed action, so that a clear and comprehensive long-term strategy to promote sustainable seafood consumption can be designed and implemented.

The National Strategy for Sustainable Development (ENDS) and the National Ocean Strategy 2030 provide a good framework. The Interministerial Commission for the Affairs of the Sea (Comissão Interministerial para os Assuntos do Mar - CIAM), in articulation with the Integrated Strategy for the Promotion of Healthy Eating (EIPAS) working group, may become the discussion forum that allows the strategic coordination to promote the sustainability of seafood consumption.

This policy option is drawn from discussions with researchers, policy-makers, influencers and businesspeople, and inspired by the results from innovative evidence-based approaches in the health sector (e.g., salt, sugar) discussed in an interministerial forum and supported by a National Strategy, that included regulatory and fiscal measures and negotiations with the industry (Polonia & Martins, 2009; Goiana-da-Silva, et al., 2019).

³⁷ Decree-Law No. 85/2019, published 01/07.

Policy measures to be further discussed might include those whose suitability and feasibility has been assessed within this research. Some measures to improve seafood consumption campaigns might include the preparation of guidelines and an official recommendations' guide. Measures aiming to change seafood supply might include promoting a business coalition, improving traceability, supporting seafood certification and improving fisheries data collection.

6.2. Policy recommendations

Recommendations on how to put the chosen policy in place can be summarized as follows:

1. A working taskforce on seafood consumption could be established by the Minister of the Sea under the umbrella of CIAM with a clear mandate to discuss sustainability key factors, define policy measures, responsible entities, targets and timeframes, monitoring and evaluation.
2. Docapesca should continue developing public campaigns focused on the valorization of sustainable and undervalued species, as committed till 2030. On the one hand, mackerel species targeted by these campaigns have had quotas higher than its catches and on the other hand, these commonly are by-catch fish in need of market-based approaches to increase its value. However, it would be important to establish a catch limit, measures that promote market regulation, an increase in research investment and include sustainability-related messages.
3. The Minister of the Sea could commission the design of a broader communication program on seafood consumption sustainability targeting mass media (TV, radio, magazines) and social media, over a long period of time. This might include disclosing the evolution of catches, consumption and first sale value of fish in the last decade, and regular publication of official seafood consumption recommendations. Public species-specific campaigns should only choose stocks that are regularly assessed and known as sustainably explored.
4. The Minister of the Sea could lobby at the European Union level for more sustainable imports and consumption policies, promote debates, workshops and conferences at national, European and global scale and work towards bilateral and multilateral agreements with other member states of the United Nations to lobby in favor of seafood consumption sustainability.

The policy option advocated herein may successfully address the urgent need to tackle seafood overconsumption in Portugal. Bringing relevant stakeholders together will enable discussion over sustainability drivers, policy integration and strategic coordination. It is a first step to a new sustainability approach. A first step for future action!

ACKNOWLEDGEMENTS

This research was funded within LEAP – Policy Development Initiative, a programme supported by the Calouste Gulbenkian Foundation in partnership with ICPA - International Centre for Policy Advocacy and IES - Social Business School. This article is the sole responsibility of the author and the views expressed herein do not necessarily reflect the positions of the Calouste Gulbenkian Foundation, or its partners, nor those of the Directorate-General for Maritime Policy.

Thanks are due to all the interviewees that kindly contributed with their time and knowledge. Thanks are also due to Eóin Young, Lisa Borges, Yorgos Stratoudakis and Catarina Resende for their enthusiasm, comments and suggestions throughout the research, and to Rita Sá and Cheila Almeida for valuable insights.

SUPPLEMENTARY MATERIAL

This article is part of a larger policy study that presents a more detailed and profound analysis of the surveys' results, describes the specificity of seafood consumption in Portugal and provides a

discussion on sustainability challenges. The full study may be made available upon request to the author.

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Shaping Portuguese choices towards more diverse, sustainable and local seafood consumption habits

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ABSTRACT

The second decade of the 21st century was rich in moments that drew citizens' attention to the environmental threats the planet is facing and to the impacts the western way of living has in ecosystems. The 'sustainability agenda' has therefore become more and more prominent in the global political discourse, with some key agreements being reached in recent years, such as the Paris Agreement and the European Green Deal, increasing the political momentum.

Consumption patterns should be taken into account when developing public policies that aim at changing, improving and implementing more sustainable habits. In Portugal, seafood consumption is deeply rooted in the culture and it is strongly linked to its citizens' identity as a maritime nation.

Additionally, Portugal has placed itself in the front row by organizing the United Nations Oceans Conference, providing a unique opportunity and context for progressive, eco-friendly and more sustainable public policies related to seafood.

This article aims at developing a roadmap on how the Portuguese government can build a new generation of food and nutrition policies and initiatives that include environmental standards, thus making seafood consumption more diverse and local.

The main recommendations of this article are 1) the creation of a task force on sustainable seafood consumption including relevant stakeholders to reach compromise regarding which species and fishing gears should be promoted by 2) a national, broad and consistent informational campaign and 3) the revision of the National Strategy for Ecological Public Procurement 2020 to include provisions on sustainable seafood public procurement.

Keywords: Seafood consumption, sustainable seafood, public policies, Portugal, public procurement.

JEL classification: Q18, Q22.

RESUMO

A segunda década do século XXI foi rica em momentos que atraíram a atenção dos cidadãos para as ameaças e para os impactos do modo de vida ocidental no planeta. A 'agenda da sustentabilidade' tem-se, portanto, tornado cada vez mais proeminente no discurso político global, com alguns acordos importantes a serem alcançados nos últimos anos, como o Acordo de Paris e o Pacto Ecológico Europeu, aumentando o momentum político.

Os padrões de consumo devem ser considerados no desenvolvimento de políticas públicas que visem mudar, melhorar e implementar hábitos mais sustentáveis. Em Portugal, o consumo de produtos pesqueiros está profundamente enraizado e ligado à auto-identidade como uma nação marítima.

Adicionalmente, Portugal colocou-se na vanguarda, organizando a Conferência das Nações Unidas para os Oceanos, o que proporciona uma oportunidade e contexto únicos para políticas públicas relacionadas com o pescado progressivas, amigas do ambiente e mais sustentáveis.

Este artigo pretende desenvolver um roteiro sobre como o Governo português pode desenvolver uma nova geração de políticas e iniciativas alimentares e nutricionais que incluam normas ambientais, tornando assim o abastecimento de pescado mais diversificado e local.

As principais recomendações são 1) a criação de um grupo de trabalho sobre o consumo sustentável de pescado, incluindo as partes interessadas relevantes para chegar a um compromisso sobre que espécies e artes de pesca devem ser promovidas por 2) uma campanha informativa nacional, ampla e consistente e 3) a revisão da Estratégia Nacional para Compras Públicas Ecológicas 2020 para incluir disposições sobre compras públicas de pescado sustentáveis.

Palavras-chave: Consumo de pescado, sustentabilidade do pescado, políticas públicas, Portugal, compras públicas.

Classificação JEL: Q18, Q22.

1. INTRODUCTION

The European Union (EU) has placed itself as a frontrunner in pursuing sustainability, endorsing in 2016 the UN '2030 Agenda for Sustainable Development'³⁸, a program aiming at building a more sustainable and fairer future for all. There are 17 Sustainable Development Goals (SDG) linked to the various dimensions of 'sustainability' and one directly targets food and access to food (SDG2³⁹). However, SDG12⁴⁰, SDG14⁴¹ and SDG15⁴² are connected to means and patterns of production, marine ecosystems, resources and use of land. Therefore, out of 17 goals, four are directly or indirectly related to food (or seafood) and the impacts of the food industry.

There are several indicators of the rise of relevance of the 'sustainability agenda' in the European political arena. An indicator of such, and part of the European Commission's (EC) strategy to implement the 2030 Agenda, is the European Green Deal, launched in late 2019, that was displayed as a renewed commitment to tackle climate and environmental-related challenges. The EC places the ocean and seafood consumption as a top priority stating that it 'will work with the member states to develop the potential of sustainable seafood as a source of low-carbon food' (European Commission, 2019).

Overarched by 'climate change', concepts such as 'biodiversity loss', 'marine pollution' or 'plastic pollution' have been increasingly linked to public health and citizens have probably never been so aware of their choices' environmental impacts, be it the origin or the way of production. This is not only true for clothes and cosmetics, but also for food.

Peano et al. (2019) argued that the ways food is produced, distributed and consumed influence the approach towards sustainability. They stated that 'the idea of sustainable consumption' has been gaining a lot of attention in the last few years and many other dimensions of food consumption have been targeted by researchers.

The new generation of European consumers care about the story behind the products. It can be a story about the products' health benefits or the sustainability of the production methods but it is clear that these young consumers seek authentic, healthy and sustainable products (Centre for the Promotion of Imports, 2020). Such concerns seem to have begun to shape people's behavior towards seafood consumption.

Regarding cultural identity and heritage, seafood consumption is one of the dearest subjects to the Portuguese. Deeply rooted in the country's maritime history, seafood eating habits constitute a part of the collective imagination that gives them an emotional and nostalgic relationship with the ocean (Garrido, 2018).

This article focuses on three dimensions of what is commonly perceived as more eco-friendly seafood choices: 1) locally caught, 2) from healthy, assessed stocks and 3) more diverse (in terms of number of species).

³⁸ <https://sdgs.un.org/2030agenda>

³⁹ End hunger, achieve food security and improved nutrition and promote sustainable agriculture

⁴⁰ Ensure sustainable consumption and production patterns

⁴¹ Conserve and sustainably use the oceans, seas and marine resources for sustainable development

⁴² Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

First, a global 'buy local' movement has been growing as the consumers become more critical about the origin of their products (Augère-Granier, 2016), assuming that buying from, for instance, EU countries ensures that certain social and environmental standards are met. Buying locally also gives people a sense of contributing to their local and closest economy and that their money is being applied in a more efficient, familiar and subsistence economy. Murray et al. (2017) identified that this is rooted in concerns about the food's environmental footprint and is often coupled with a desire to support local producers, who are usually perceived as producing food in more sustainable ways.

Seafood carbon footprints are very variable. A study found that, for more than 20 Norwegian seafood products delivered to various places globally, carbon footprints can go from 0.7 to 14.0 kg CO₂e/kilogram of edible product (Madin & Macreadie, 2015).

Emissions have to be cut by 7% annually in order to meet the Paris Agreement targets (UNEP, 2019). During COP-22, Portugal announced a compromise to reach carbon neutrality by 2050. According to the Minister of the Environment and Climate Action (MECA), it will 'require us to do a lot. It forces us to reduce emissions by more than 85% compared to 2005 emissions. It requires us to go from 68 million to 12 million tons of carbon dioxide emissions per year'⁴³.

Second, and because buying seafood caught in Portuguese waters per se does not guarantee its sustainability, this article also focuses on promoting the purchase of seafood from sustainable, assessed and well managed stocks. This information is provided by international scientific entities (e.g. International Council for the Exploration of the Sea, the scientific body of the International Commission for the Conservation of Atlantic Tunas), national research centers or other peer-reviewed studies. The Portuguese NGOs of PONG-Pesca⁴⁴ agree that whenever scientific information for a stock or species is unavailable or insufficient, its consumption should not be promoted and I follow that premise.

The third dimension this study addresses is diversification. The Portuguese concentrate nearly 50% of their seafood choices in three species (cod, tuna and hake) being more than ⅓ cod (Pinho, 2019). They consume more than the double of the EU's average but do not necessarily vary the consumption. They also tend to prefer top predators, which means that the pressure resulting from the Portuguese eating habits is applied not only on a limited number of species, but also on the higher levels of the food chain, impacting the lower levels.

My goal is to ascertain how the Portuguese consumers can be influenced by governmental initiatives into including other species – from stocks that are duly assessed, considered sustainable and caught by the national fleet and – in their diet. In this article, I will only focus on wild seafood, because it is the vast majority of what the Portuguese consume (Pinho, 2019).

The article is thus organized as follows: first is provided an overview of the global initiatives related to sustainability, climate emergency and environmental concerns that motivated it. The second section gives context about the relationship Portuguese have with seafood and explains some of the environmental issues that can arise from such strong seafood-eating habits. Next, a review of what other authors have found to be more or less effective for governments to influence people's dietary choices and examples of initiatives that have been put in place in Portugal to influence the seafood consumption habits. The fourth section illustrates the evolution of public policies addressing food in Portugal. The next section systematizes the policy options that arise from interviews with experts and options that are usually put in place to influence dietary choices. What is considered to be the most adequate options for Portugal is also presented. The sixth section includes the conclusions and recommendations for implementing actions.

2. SEAFOOD CONSUMPTION IN PORTUGAL

The Portuguese consumed 61 kg of seafood per capita in 2019, 2.5 times the EU's average. Portugal is the EU country where the ratio between the expenditure in meat versus seafood is the most balanced, with seafood representing 47% of the expenditure on animal protein. The amount spent by the Portuguese on seafood was more than triple the EU average (€371) (EUMOFA, 2020).

⁴³ <https://www.portugal.gov.pt/pt/gc21/comunicacao/noticia?i=governo-reitera-compromisso-de-neutralidade-carbonica>

⁴⁴ PONG-Pesca is the Portuguese platform of NGOs working on fisheries-related issues

Guidelines from the UK's National Health System (NHS) show that the average per capita weekly seafood consumption is around 300g for a healthy and balanced diet, which amounts to about 14.4 kg/per year⁴⁵. The Portuguese consume more than four times that.

On the source of the seafood, even though Portugal's territory is 90% sea, EC's data show that $\frac{2}{3}$ of the seafood the Portuguese consume is imported, being almost 40% a species that does not exist in Portuguese waters – cod (Pinho, 2019). During “Estado Novo”⁴⁶, the system of protection and promotion of the fisheries sector aimed to normalize food supply and reduce the external deficit. A tenacious propaganda about the return of Portugal to the sea promoted by the regime made fishing an emblem of national resurgence. Cod was given special attention (Garrido, 2000).

An initiative named ‘Fish Dependence Day’ (FDD), developed by the New Economics Foundation (NEF), estimates how self-sufficient in fish the EU and member states are. The FDD is the date on the calendar when the country begins to rely on fish from outside Europe. In 16 years, the EU's FDD has moved from August 4 to July 9. The same report notes that these consumption patterns are jeopardizing non-EU countries, since ‘many of the costs of EU fisheries mismanagement and historical overfishing are being exported, with direct impact on the fish stocks’ of third countries. Change is desperately needed if we are to break this pattern’, it concludes (NEF, 2018).

Since most of the seafood comes from abroad, it is likely that the Portuguese seafood consumption habits severely impact other places worldwide. Amongst the three most consumed species *per capita/per year* (22 kg of cod, 3.3 kg of tuna and 3.1 kg of hake) (Pinho, 2019), the first does not occur in national waters (Sierra Flores, 2014), the second has severe issues related to overfishing across the world (Fromentin et al., 2014) and the third has been severely overfished in the Atlantic but it seems to be improving (Elhuyar Fundazioa, 2011). This means that the Portuguese concentrate 50% of their seafood intake in only three species that have or had severe sustainability problems.

The EU's self-sufficiency of cod in 2018 was only 8% and the origin was mainly Norway and Iceland (EUMOFA, 2020). Despite there is not a direct relationship between a species being imported and its unsustainability, given that the quantity of cod the Portuguese eat alone is already more than the recommended quantity for a healthy diet, this article will focus on the need to shift from cod consumption.

Regarding tuna, there are eight major species, from which the most consumed in Portugal is presumably *Katsuwonus pelamis* (mostly canned) whose conservation state is considered as of least concern, by the International Union for Conservation of Nature (IUCN). However, the two species that are mostly targeted by the Portuguese fleet, *Thunnus obesus* and *Thunnus thynnus*, are important for this fleet's subsistence, with the quota being increasingly used (and currently being used in total, according to the most recent data). In 2017, tuna catches in the Azores increased 84%, compared to the previous year (INE, 2017). Both these species are not considered to be in a good conservation status, being listed by the IUCN as vulnerable and endangered, respectively.

Hake is mostly caught by trawlers, a gear that provokes several environmental impacts such as the reduction of biomass and biodiversity of the benthic ecosystems (Eigaard et al., 2017). This fleet's environmental impacts are widely known and its regulation and reduction are one of the main concerns of marine NGOs.

There is room for improvement in terms of diversification as the Portuguese fleet is very multi-specific, catching more than 200 species (Almeida et al., 2015a). Most of these species are ignored or disregarded and are virtually absent from the Portuguese tables.

The fact that the Portuguese consume 61 kg/per capita of seafood does not constitute a problem per se. The issue is that data suggest that there is simply not enough seafood caught nationally to supply this demand without having major consequences on the environment and on other communities, especially in developing countries, where fisheries usually have poorly defined rights and monitoring and control are loosened (Eggert & Greker, 2009).

2.1. Ending overfishing

Despite the importance of seafood in Portuguese diet, no study has been conducted on to what extent the Portuguese seafood eating habits contribute to the overexploitation of marine resources.

⁴⁵ <https://www.nhs.uk/live-well/eat-well/fish-and-shellfish-nutrition/>

⁴⁶ “Estado Novo” was the dictatorial, authoritarian, autocratic and corporatist state regime that ruled Portugal for 41 years, since the approval of the 1933 Constitution to its overthrow by the Revolution of April 25, 1974.

In the EU, overfishing has been and still is a significant problem and the Common Fisheries Policy (CFP) included specific goals to end overfishing in its waters by 2020, by the latest. Despite the efforts and improvements in setting Total Admissible Catches (TACs) in line with scientific advice (therefore moving towards ending overfishing) data show that, for 2020, 46% of Northeast Atlantic TACs still exceeded scientific advice (Pew, 2020). With a growing human population and increasing economic power in developing countries, seafood demand is more than likely to increase and overfishing may not meet its end any time soon.

Cod constitutes an emblematic example of what can be the most significant environmental impact of overfishing: stocks collapse. In 1993, in what came to be the end of a long story of mismanagement, six Canadian populations of Atlantic cod (*Gadus morhua*) collapsed to the point where the fishery had to be closed (Myers et al., 1997). Eastern Baltic cod was also under the spotlight in July 2019, when the EC approved emergency measures to prevent the stock's collapse.

Ending overfishing would greatly benefit fishers and communities, but the benefits do not end there. Sumaila & Tai (2019) highlighted how the fight against climate change would benefit if overfishing ended. Such would be fundamental in rebuilding resilience of marine ecosystems, which in turn has been found to be one of the best ways to cope with extreme climate events. The interaction between fishing and climate change was also studied by Cheung et al. (2018), finding that the number of species with high extinction risk would decrease by 63% if a sustainable fisheries-low emission scenario was implemented. The same study also highlights the importance of eliminating overfishing as an adaptation measure to reduce mid-term extinction risk from climate change. Earlier, Brander (2007) found that there are strong interactions between the effects of fishing and the effects of climate since fishing reduces the age, size and geographic diversity of populations and the biodiversity of marine ecosystems, making both more sensitive to additional stresses such as climate change.

Fleming et al. (2019) studied the link between a healthy ocean and public health and found that the broader range of benefits from coastal seas and open ocean includes 'supporting' (e.g. nutrient cycling), 'regulating' (e.g. carbon sequestration) and 'provisioning' (e.g. seafood) services. They highlighted seafood as a service that is at risk, stating that fish that could be used to sustain local coastal communities (e.g. herring) are being processed into fish meal for use in high value aquaculture (e.g. salmon) to meet demand in high-income countries.

3. GOVERNMENTS TRYING TO INFLUENCE CITIZEN'S DIETARY CHOICES

Richter & Klöckner (2017) created a hypothetical model that integrates all the variables considered important when a consumer evaluates the purchase of sustainable seafood. Their findings suggest that the consumption of sustainable seafood can be the result of both the intention to consume seafood more sustainably and a habit around food consumption. When present, unsustainable seafood eating habits are particularly difficult to overcome because habits lead to disregard of new information and overestimation of disadvantages of alternative behaviors (Richter & Klöckner, 2017).

Ralston (1999) studied how governments could affect dietary choices and concluded that policies and regulations that directly or indirectly affect the supply or prices of food products, their safety and nutritional composition influence the food choices consumers make and, ultimately, the nutritional quality of their diets.

Mozaffarian et al. (2018) described several policy interventions a government can undertake in order to influence people's dietary choices, from voluntary to mandatory. These include bills, laws/acts/statutes, agency implementation, court decision, guidelines or directives. They also extensively describe a dozen policy strategies, listing some examples in each strategy as well as their strengths, limitations, uncertainties and recommendations.

Marette et al. (2008) argued that the solution to promote or avoid certain types of food should not be merely linked to taxation and subsidization but instead to a combination of those with an information program. The authors only focus on the dichotomy of fat tax/thin subsidy, highlighting the concern with health, suggesting for the first time that the criteria used to define and apply taxes and subsidies can include 'other environmental objectives, such as the resource depletion of certain fish species', combined with health considerations.

In a complementary angle, Griffith & O'Connell (2010) defined three possible types of policy intervention: 1) education and information provision, 2) taxation and 3) regulation.

Brambila-Macias et al. (2011) divided policy interventions targeting food consumption into two strands: 1) policies supporting more informed choice and 2) policies aimed at changing the market environment. They also found that the school environment matters and that efforts to encourage students to adopt a healthy lifestyle are effective. The same can apply to more sustainable choices. Additionally, they found the same to be true for adults and that a healthy meal provision in the workplace has positive behavioral and health outcomes.

Van Loo et al. (2017) concluded that behavioral insights essentially support what is typically known as 'soft' policy approaches (policies supporting informed choice, such as public information campaigns and others). However, if the consumers are already involved and informed about food-related health and sustainability aspects, they will be more open to more radical actions to stimulate healthy and sustainable diets, such as policies targeting the market environment such as product reformulations or fiscal measures. Research also shows that 'hard' approaches are more effectively translated into action than 'soft' approaches, but the first are more intrusive and less publicly accepted. At a later stage, when consumers are more engaged with these issues, they may be more likely to accept more radical, intrusive policy actions.

There seems to be an opportunity for consumers to shape the seafood market by using their power, demands and purchase habits. However, there is also space for the governments to intervene.

4. PUBLIC POLICIES ADDRESSING FOOD IN PORTUGAL: FROM FOOD TO NUTRITIONAL TO ENVIRONMENTAL POLICIES

In Portugal, the first steps towards the implementation of a food and nutrition policy were given in 1976 and only in 1989 the first set of recommendations for the formulation of a food and nutrition policy was published by the National Council (Graça & Gregório, 2012).

Until the early 90s, the efforts to implement a strategy were strongly linked to the need of building knowledge about the national food consumption patterns. The lack of data was evident and such would be fundamental for public policies targeting the importance of food education for health promotion. Concepts such as 'health', 'food quality' or 'food safety' began to shape the public speech. However, only in the beginning of the new millennium serious measures and policies were put in place to address what was starting to become one of the most fatal medical conditions in the Western hemisphere: obesity (Graça & Gregório, 2012).

Due to this change of focus over the years, the same authors distinguish 'food policies' from 'nutritional policies'. This article discusses if the government is currently at the edge of a third generation of food-related policies: environmental policies.

Van Loo et al. (2017) identified that negative impacts on both human and planetary health show that there is an urgent need for policies to integrate not only public health nutrition but also environmental sustainability goals. The authors concluded the goal should be to encourage the adoption of diets that are both healthy and sustainable.

Capacci et al. (2012) studied the effectiveness of certain public policies and found out that 1) regulation of meals in schools/workplace, 2) nutrition-related standards and 3) public information campaigns have a 'suggestive' positive impact (having the latter strong evidence on awareness/attitudes or intentions, but small impact on behaviors).

A report by Fischer & Garnett (2016) states that few governments have issued guidelines promoting what they called 'win-win' diets, i.e. diets that help to tackle two challenges – securing healthy nutrition for all and protecting the environment. The report supports the narrative that countries that already have food-related guidelines should begin to consider a process of incorporating sustainability.

In recent years, the Portuguese government has published specific regulations related to this. In 2017, the Integrated Strategy for the Promotion of Healthy Eating (EIPAS)⁴⁷ was launched. This document does not address 'sustainability' but, given the global context of awareness related to the biodiversity crisis (Newman et al., 2020), it would be important to include a section about this issue in a next version. The evaluation of the first year of the strategy's implementation shows that reformulation and monitorization was implemented in products that represent at least 80% of the

⁴⁷ The Integrated Strategy for the Promotion of Healthy Eating (EIPAS) gathers a set of intervention proposals in this area, agreed by an inter-ministerial working group led by Directorate-General for Health.

consumption (e.g. salty and sweetened snacks, cereals, beverages). In the same year, new legislation made it compulsory that all public canteens have at least one vegetarian option. A report from 2018 showed that, from September to May, despite 49% of the school canteens asked for vegetarian meals, less than 1% of the meals served were vegetarian (DGEstE, 2018). This may be explained by the poor quality and diversity of the vegetarian meals, with some students and parents complaining that the nutritional balance of these meals was not assured, with very little variety and protein intake (Lusa, 2019). This case shows how legislation can be impaired if the right implementation and monitoring fails.

The vast majority of publications or guidelines focus on policy interventions to shape what a 'healthy diet' should look like. Such initiatives appeared and were implemented after the identification of a public health problem (diabetes, hypertension or other chronic conditions). In all cases, the target is solely human health. Public health has been the main driver for these campaigns and governments are usually willing to spend enormous amounts of funds on them since these medical conditions cause health problems in citizens (whose healthcare costs will most likely be supported by the State) and will impair their productivity and life expectancy. In terms of Social Security and NHS sustainability, it still is a better strategy to prevent than to cure, as explained both in EIPAS and in the introductory section of 'Impact of the 'sugar-tax' on sugary and sweetened beverages' (Government of Portugal, 2018).

Public entities of some countries, such as France, the UK, Germany, the Netherlands and Sweden, have already started to target food consumption sustainability (Van Loo et al., 2017). It is expected that the Portuguese government starts to include these concerns when issuing guidelines for diet choices. Ultimately, it is not only about human health, but also about the 'planet's health'. Human dietary choices should be made according to what promotes human health but should also contemplate the environmental impacts of such choices.

The list of what one should consider when buying food is long: carbon footprint, land use, habitat degradation, use of water, deforestation, overfishing, chemical pollution, human and labor rights violations, energy used in processing, animal rights and welfare, unfair competition and the list goes on (Gjerris et al., 2016). As for other issues, being conscious about the impacts of our choices is the first step to minimize them through our preferences and purchases. Assuming the same rationale, i.e. the government is proactive and tries to influence people's diets because of public health (that ultimately results in gains for the State), it should also put in place initiatives to redirect people into more sustainable food choices since the costs of environmental restoration and mitigation will mostly be supported by it.

Food-related policies are typically included in a broader set of health policies. The question is whether the Portuguese government is willing to acknowledge the intersectionality of such policies and start acknowledging them as 'environmental policies'.

In 2015, the 'Green Taxation Reform' entered into force and it included goals such as penalizing what 'pollutes and degrades' and 'inducing more sustainable patterns of production and consumption'. 'Food' is not mentioned throughout the document, which may illustrate that food was still not seen as part of the 'sustainability agenda' and that intervening in the food taxation system was not acknowledged as an opportunity to pave the path towards sustainability.

Associação Portuguesa de Nutrição (2017) published an e-book about food sustainability and it suggested reducing animal protein intake. Regarding seafood, the advice is to consume national and seasonal products, above the minimum legal size. In early 2019, the Portuguese NHS published a list⁴⁸ with seven tips for a 'healthier food consumption' and the reduction of animal protein consumption – with environmental purposes – was suggested. It also included guidelines on consuming locally and choosing plastic-free items. This suggests that there is openness to include recommendations about food and environment sustainability, even in documents produced by entities that do not directly address these issues (in this case, the NHS).

The National Strategy for Public Ecological Procurement 2020⁴⁹ envisions the 'acquisition of aquaculture and fish products produced or captured sustainably' and mentions the preference for short circuits in a generic manner. There are six priority working groups in this strategy, being one

⁴⁸ <https://www.sns.gov.pt/noticias/2019/01/03/alimentacao-mais-saudavel-em-2019/>

⁴⁹ The National Strategy for Public Ecological Procurement 2020 (ENCPE 2020) incorporates sustainability in public procurement, being a complementary instrument of the environmental policies, contributing to the promotion of the reduction of pollution and of the consumption of natural resources. The follow-up and monitoring of the implementation of ENCPE 2020 is under the responsibility of the Portuguese Environment Agency (APA).

‘Food products and catering services’. However, from the 11 public and private entities represented in this working group, none is connected to the ocean.

A study published in 2012, based on extensive questionnaires that aimed at collecting the Portuguese’s perception about several issues linked to the environment, shows that, in 2011, only 9% of the respondents ‘chose local products or food’, compared to 28% in the EU, and 8% admitted to ‘buy more eco-friendly products with eco-labels’, compared to 17% in the EU (Schmidt & Delicado, 2012).

However, a survey from 2019 showed that 8 out of 10 Portuguese considered that the government should intervene to promote more sustainable eating habits and that most strongly support the broadening of measures (Truninger et al., 2019). The same percentage of respondents stated that there should be more campaigns communicating the environmental impacts of food production and would support the reduction of unsustainable food in public canteens. The same survey shows that controlling meals in schools, reducing unhealthy supply and promoting organic farming are some of the areas in which the Portuguese advocate for public policies whether by enforcement and control measures, fiscal policies or explicit legislation.

Prothero et al. (2011) found that there is a constant gap between articulated positive attitudes towards sustainability and people’s actual (mostly unsustainable) consumption behavior. This means that, although surveys like Truninger et al. suggest that the Portuguese seem highly motivated to make more eco-friendly their consumption habits, their actions may not match their intentions. Almeida et al. (2015b) determined precisely that the Portuguese have good knowledge about seafood but this is not necessarily related to sustainable choices. According to the authors, this may have a negative double effect: on the one hand, this gap will continue to frustrate producers of sustainable alternatives who rely on traditional, attitudinal market research methods; on the other hand, this will limit the availability of sustainable product alternatives and thus limits the shift towards more sustainable consumption.

Truninger et al.’s more recent results, however, may indicate that citizens are currently more conscious of their consumption’s impacts. Nevertheless, one of the biggest obstacles in the implementation of initiatives to increase the consumption of local, sustainable seafood may be that, even though it is not always the case, local food is perceived as being more expensive than non-local food (Donaher & Lynes, 2017).

In Portugal, no governmental initiative promoting seafood that is better for the ‘planet’s health’ has been put in place. Ideally, the government does not act alone to boost change and complementary efforts should be made. Mozaffarian et al. (2018) acknowledged that, although strong government policy is essential to help achieve a healthy, profitable, equitable and sustainable food system that benefits all, specific actions by major stakeholders should, at the same time, promote, facilitate, and complement policy efforts. Specifically, when dealing with seafood consumption, stakeholders such as producers’ organizations, fishers associations, retailers, relevant consumers’ organizations, environmental scientists, nutritionists, NGOs and tax experts should communicate and be brought together in a task force to ensure that every interest and concern is weighted and that any proposed initiative takes into account the majority of these.

4.1. NGO-led initiatives to promote the consumption of sustainable seafood

Influencing more responsible and sustainable seafood consumption habits has not been a flagship issue to civil servants and there is not a general consensus that this issue needs to be addressed. Apart from initiatives led by Docapesca⁵⁰ to promote two species (horse mackerel and mackerel; and mainly motivated by the low market value and high volumes available), only NGOs have tried to address the issue.

Almeida (2014) states that the concept of ‘sustainable seafood consumption’ was introduced to the Portuguese public in 2010 by a Greenpeace campaign that rated retailers according to their seafood sources and released a red list of species to avoid. However, many criticisms were made because the campaign failed to take into account the specificities of the Portuguese context and fleet. Despite it, this action was certainly important to start a conversation about the sustainability of the Portuguese seafood habits, something that was absent until then. Also in 2010, *Liga para Protecção da Natureza*

⁵⁰ Docapesca is the state-owned company responsible for the fish’s first sale and managing mainland’s auction centers. It is also responsible for paying fishers’ social security according to the landings and their volume of business.

(LPN), an NGO, launched the website '*Que Peixe Comer*⁵¹' with a list of the most consumed species in Portugal, information about them and a set of recommendations of species and fishing methods that were considered less destructive. In 2010, the message was already accurate, as Público's interviewee stated, 'it's not about eating less, but diverse instead. After all, there are about 200 species of seafood that are captured in Portugal but those appearing in our tables are much less' (Garcia, 2010). There has not been a formal evaluation of this project's implementation or its influence but one of the responsible stated that within two months of the launch of the website, it received about 12,000 visits.

Another initiative was implemented in 2015 by a fishers' association, partnering with LPN, to promote the consumption of sustainable and local fish – '*Cabaz do Peixe*' ('fish basket' in English), where fresh seafood from Sesimbra is sold weekly in seven delivery points around Lisbon. This project focuses on fish caught by mainly hooks, takes advantage of seasonality and has a lower carbon footprint. Short distribution circuits applied to seafood contribute to the sustainability of fish consumption by reducing the ecological footprint related to transport and by promoting the consumption of species that are not usually targeted by industrial fishing (McClenachan et al., 2014). The project is currently selling 115 fish baskets (345 kg of seafood) every week, 'being a general consensus in this project that getting customers for the product sold was never a difficulty' (Grilo & Pita, 2017).

In 2018, ANP|WWF implemented the project Fish Forward where one of the strands of work was to influence schools to make better, more sustainable choices for their canteens. This project is still running but, regarding canteens, a lot of (mainly bureaucratic) obstacles were found along the process, making it difficult to implement.

Despite having support from governmental bodies, these projects were developed and implemented by non-governmental entities. The question remains on to what extent should the government lead by example and be the engine of change.

5. POLICY OPTIONS USED TO INFLUENCE MORE ECO-FRIENDLY AND HEALTHY DIETARY HABITS

There are several tested and validated options that can be adopted to influence and shift a population's food procurement habits. Table 1 assembles some of the policy options that have been published in peer-reviewed literature.

This research was complemented with six targeted formal interviews to experts with different backgrounds and expertise: green taxes, fish sale, fisheries administration, NGOs and environmental education. Each interview, important to complement information collected on literature and content analysis of legislation and guidelines, was conducted in a way that allowed the interviewee to give a holistic and comprehensive perspective of the topic, having their background and work experience as the central theme.

⁵¹ Translated to 'What fish you should eat'. The website (<http://quepeixecomer.lpn.pt/>) is no longer online but more information on the project can be found here: <https://www.lpn.pt/pt/conservacao-da-natureza/historico-de-projetos/que-peixe-comer-para-um-consumo-sustentavel>.

TABLE 1: TYPES OF POLICY OPTIONS THAT ARE CONSIDERED BY GOVERNMENTS TO INFLUENCE CONSUMERS' BEHAVIOR TO HEALTHIER FOOD CHOICES

Griffith & O'Connell (2010)	Capacci <i>et al.</i> (2012)	Gorski & Roberto (2015)	Hyseni <i>et al.</i> (2017)	Mozaffarian <i>et al.</i> (2018)
Education and information provision	Advertising controls	Mandates (e.g., vaccinations required for children in order to attend school, smoke-free air laws)	Food price (policies influencing prices through taxes, subsidies or economic incentives)	Population education
Taxation	Public information campaigns	Restrictions (e.g., prohibit the sale of alcohol to minors)	Food promotion (advertising/marketing; particularly on children; media campaigns and health education)	Point-of-purchase labelling
Regulation	Nutrition education	Economic incentives (e.g., excise tax on cigarettes)	Food provision (in specific settings: schools, communities or workplaces)	Fiscal incentives and disincentives
	Nutrition labeling	Marketing limits (e.g., regulation of tobacco advertising)	Food composition (reformulation or elimination)	Food assistance programs
	Nutrition information on menus	Information provision (e.g., education campaigns to promote fruits and vegetables, requiring warning labels on tobacco products)	Food labelling (nutrition labelling, calorie labelling in stores/restaurants)	Procurement nutrition standards
	Fiscal measures	Environmental defaults (e.g., changing the default restaurant side dish from French fries to salad)	Food supply chain, trade and investment (including legislation or regulation affecting production policies or supply-chain logistics)	Industry quality standards
	Regulation of meals		Multi-component interventions (including at least two of the categories described above)	Schools, after school and early child care
	Nutrition-related standards			Worksite wellness
	Government action to encourage private-sector action			Health systems
	Measures to increase availability to disadvantaged consumers			Food marketing standards
	Liability laws			Local built environment
				Research and innovation
				Coordination of actions across ministries, agencies, and at local, national, and international levels

Source: Author's elaboration.

Four categories of policy action were organized (Table 2).

- 'Information' includes certification schemes, labels, public campaigns without marketing intents, educational programs and others. In certification programs, fisheries are usually evaluated against a set of criteria (e.g. selectivity, environmental impacts, bycatch levels). Governmental entities usually have little to no participation in the implementation of these measures but can act as promoters and/or facilitators. Campaigns launched by governmental entities also fit in this category. Commonly used in nutrition education, it is usually the go-to solution because it provides the consumers with information they lack, hopefully enabling them to make fully informed choices. As stated by Griffith & O'Connell (2010), an effective information campaign needs to succeed in conveying a message that is consistent with improving diet but is simple enough for consumers to understand. Hyseni et al. (2017) considered measures included in this category generally less effective and with less certain long-term benefits.
- 'Fiscal measures' can assume the form of subsidies or taxes. This set of policies is designed to change the price of certain types of food. Put simply, their goal is to dissuade or to promote the consumption of specific groups of food (e.g. taxation of sugary beverages that came into force in Portugal in 2017). They can also be used to raise revenues that can later be applied to funding related-activities that are perceived as better/good. Taxation is usually considered to be among the measures that are the most effective and fastest to take effect. Hyseni et al. (2017) findings suggest that 'upstream' interventions such as price interventions appear to be consistently effective in improving healthy eating. However, Portugal is part of the EU, meaning that, to some extent, it cannot freely set prices. The EU does not have a direct role in collecting taxes or setting tax rates, but it oversees national tax rules in some areas (particularly in relation to EU business and consumer policies). In that sense, the single market allows goods and services to be traded freely across borders within the EU and the member states have agreed to align their rules for taxing goods and services. In a nutshell, this means no member state is allowed to have an unfair advantage over competitors, so it would be illegal to make a price discrimination between Portuguese and foreign products, taxing the later.
- 'Legislation' innovation can only go so far to change food consumption habits, but adequate legislation with the proper incentives and control can be quite successful. A change so deep has to happen over time, needing a lot of education and awareness. Griffith & O'Connell (2010) state that correcting the ways in which food markets fail by targeting consumers may be difficult and it may be more effective to regulate the firms that produce and sell food products. Public entities can start implementing changes, leading by example, because any measure would encompass thousands of people and would allow them to become more familiar and learn about the products they are not used to buying or consuming. The government is a large employer and food purchaser and if it implements nutrition standards to guide all food procurement for public facilities and other government-funded organizations, a high number of people will end up being influenced. Legislation is also important in advertising, usually motivated by health issues (e.g. prohibiting tobacco advertising, promotion or sponsorship).
- 'Advertising' usually assumes the form of marketing, media or social media campaigns. These campaigns are often costly and their impacts are difficult and expensive to assess. Brambila-Macias et al. (2011) found that, when promoting healthier diets, policy interventions aiming at reducing or banning certain food advertisements generally have a weak positive effect on improving diets, while public information campaigns are more successful in raising awareness of unhealthy eating but sometimes do not succeed at turning into action.

The type of policy actions, policy measures and respective advantages and disadvantages were systematized in Table 2.

TABLE 2: FIELDS OF ACTION, SPECIFIC POLICY MEASURES AND RESPECTIVE ADVANTAGES AND DISADVANTAGES OF IMPLEMENTATION

Policy field of action	Policy measure	Advantages	Disadvantages
Information	<ul style="list-style-type: none"> - carbon footprints calculators - national campaign(s) on supermarkets and media - labelling 	<ul style="list-style-type: none"> - high number of ecolabelling schemes already developed - perceived as a 'soft' policy with in which industry is more comfortable and can indirectly promote industry reformulations - if national, campaigns can reach a very high number of people - more people are interested in the origin and impacts of their choices 	<ul style="list-style-type: none"> - developing new measures is time-consuming - effects usually take a lot of time to appear - can be costly - difficult to assess impact - high data demanding - it can lead to confusion among the less educated consumers or if mixed with other initiatives
Fiscal measures	<ul style="list-style-type: none"> - taxation and subsidization of products according to their impact on the environment - economic benefits for companies (retailers and seafood processors) that demonstrably advertise/make promotions for more sustainable and local seafood as well as for different species 	<ul style="list-style-type: none"> - it can produce fast results - if legislated that way, it can generate extra revenue that can be applied in environmental, restoration and conservation actions 	<ul style="list-style-type: none"> - it may alienate part of the population we want to engage - has to be supported by heavily and widespread information campaigns - may target only the low-income consumers - hard to implement due to strict EU laws related to the 'single-market' - could potentially take a lot of time to legislate and implement - it could create strong opposition and lobbying by industry
Legislation	<ul style="list-style-type: none"> - seafood procurement standards in public facilities - regulation of meals in public institutions - coordination of actions across ministries, agencies, and at local, national, and international levels 	<ul style="list-style-type: none"> - depends mainly on the government initiative - government can implement some measures in public facilities as it is one of the largest employers - would impact a large portion of the population - setting purchase standards for government is low-cost 	<ul style="list-style-type: none"> - making new legislation is usually time-consuming - it requires experts from various fields that are not always available or in the government - following purchase standards inside the government can be costly - very demanding in terms of political capital
Advertising	<ul style="list-style-type: none"> - introduction of limits of what can and cannot be advertised in media according to their impact on the environment 	<ul style="list-style-type: none"> - big potential for education and dissemination - costs can be relatively decreased if social media are used - government has a direct role in its regulation by restricting it 	<ul style="list-style-type: none"> - difficult to collect retailers and private sector support - it can create a backlash if perceived as freedom restraining - marketing through unconventional means is hard to verify

Source: Author's elaboration.

5.1. Definition and implementation of policies

Literature and results from interviews showed that a combined approach should be more adequate. Legislation/regulation modifications and fiscal measures usually have the fastest and more meaningful results (Mozaffarian et al., 2018; Brambila-Macias et al., 2011; Marette et al., 2008; Ralston, 1999). However, in terms of changing habits and overall mindset, these measures are not as successful and they risk a setback if the political environment changes, since people may not understand and/or have internalized the background and motivation of such policy.

This is why the studies analysed also point out the need for providing unbiased information detached from private interests. Acknowledging that the biodiversity crisis and climate change are two of the biggest challenges of our time is to recognize that governments must take actions in line with the emergency. Therefore, communicating the impact of certain activities or products should be mandatory.

Likewise, a comprehensive program that educates and incentivizes people to make more diverse seafood choices, led by national entities and publicly funded should be implemented. This program would have to make clear what to pay attention to when buying fish (e.g. minimum conservation sizes, fishing gear, if traditional or industrial, seasonality, origin, conservation status) and why it is important to have these concerns. Images displaying the environmental impacts of certain fishing gears could also be included, as happens with tobacco nowadays. It could be regulated, for instance, that ads of companies that sell seafood caught by bottom trawlers (which is typically the case of shrimp and other crustaceans) came with a warning about the effects such gears have on the environment. It is important however that this program is preceded by an extensive market study to realize who it should target and what communication strategies are more effective.

Results show that experts do not find fiscal measures the most adequate option and think this problem should be addressed mainly through educational and awareness initiatives, rather than legislation and compulsory actions. Fiscal measures were pointed out as not as effective mainly due to the fact that Portugal, being a member state of the EU, is not allowed to make a price distinction between what is national and what is not. Experts agree that changing the price of a product can influence purchase habits but does not have the desired and most productive outcome of educating people. Experts also agree that it is better to make a positive distinction of national products (such as origin labels) than to increase the price of certain products, which could have an adverse effect on consumers, alienating them instead of leveraging more sustainable choices.

Uncertainty about the outcomes of fiscal measures is related to the extent of the substitution effects and uncertainty about distributional impacts. Fiscal measures are 'hard' policies and they would have to be introduced in a posterior phase, where the population is more informed and willing to accept these types of intervention. Additionally, Capacci et al. (2012) found that there is some evidence that subsidies tend to be more effective (and cost-effective) than taxes.

A mixed approach includes measures that are already implemented but need enhancement, intensification or upgrade. This option does not target revolutionizing the system but instead taking a positive approach of mapping what is in place, coordinating the initiatives, turning them into a broader national campaign, developing a medium/long term plan of implementation and, above all, setting clear seafood consumption targets as well as monitoring the implementation in order to make it adaptable.

A strategy to increase the consumption of more diverse, sustainable and national seafood would strongly benefit from the creation of a task force co-chaired by the Secretary of State of the Environment and the Secretary of State of Fisheries. These two entities would be able to include this task force in their efforts and commitments to reach carbon neutrality by 2050 and manage fish stocks sustainably, respectively. The group would include representatives from the fishing and aquaculture sectors, the processing industry, consumers' organizations, Docapesca, NGOs, marine and climate researchers, retailers, small business associations, representatives from the Directorate-General of Health and from the Directorate-General of Education.

This set of specialists would be mandated to choose, using the best scientific advice and through general consensus, which species and fishing gears were to be promoted by the informational campaign that should have a positive angle, i.e. no advising against any species or fishing gear, but instead the rhetoric would be focused on which species and gears are to be preferred. The campaign would have national dissemination, the brand of both MECA and Ministry of the Sea. It would have to be designed in an adaptable way to allow revisiting it to ascertain whether the species being

recommended still met the sustainability criteria (e.g. if they are formally assessed and continue within safe biological limits).

A study explored which are the critical factors for the success of commercial food marketing campaigns related to the issue of nutrition and health. It drafted conclusions regarding to which extent these could be transferable to the public health sector (Aschemann-Witzel et al., 2012). Such a campaign should rely on 1) intensive research on consumers' or citizens' behavior and new societal trends must be done in advance, 2) add a stronger emotional appeal, 3) appeal to common values, and allow the experience of being part of a movement or group, or re-connecting to the local community, 4) use social networks and emerging online social media and 5) be simple, clear and achievable, stressing short-term benefits alongside the long-term benefit of good health.

However, this solution only goes so far: the change it aims is based on the assumption that people will internalize the information provided and act accordingly, making better and more sustainable choices, which is not always the case. Research showed that knowing about barriers and facilitators help consumers to change their behaviors towards more sustainable choices, however most information campaigns that aim at communicating these issues focus solely on improving consumers' baseline knowledge, which *per se* is not enough.

Information is seldom a silver bullet solution. To bridge this gap, and because more informed people become more willing to make bigger changes, a complementary option should be added. Besides the suggested campaign, the government should also implement more proactive actions. Meal coordination and regulation across all public entities and services (e.g. schools, ministries, faculties, hospitals, courts, prisons) would be very important since it would end up targeting thousands of citizens that use these facilities on a daily basis. Such coordination would ensure that the advice from the task force would guide the purchases made by and for the public entities' canteens. This could be part of a governmental action plan that, by leading by example, would encourage citizens to shift some of their habits at home. It could even pave the path for some restricting future actions such as setting advertising limits, as some authors have agreed to be effective.

In 2019, Portugal had nearly 699,000 public employees (PORDATAa). In 2014, a report found that about 14% of the Portuguese had the habit of taking their own meals to work (Lusa, 2016). Nevertheless, not all public facilities have a canteen and several other factors can lead employees not to use the canteen available at the workplace.

Additionally, there are almost 1,613,000 students in more than 5,000 public teaching facilities (PORDATAB). Virtually all of them have a canteen. In 2017, public school canteens were serving about 500,000 meals daily⁵². These numbers suggest that such policies could potentially impact at least half million people a day if standards and information on sustainable seafood in public canteens were introduced. To materialize this, it would be important that the working group on food created by the ENCPPE 2020 is restructured to include one of the public entities that deal with seafood consumption (Directorate-General of Natural Resources, Safety and Maritime Services (DGRM)).

Citizens tend to resist more intrusive and restrictive measures and are more open to informational 'soft' policy measures that gather trust by not breaking with what is traditionally in place. The presented mixed solution would increase the odds of success.

6. CONCLUSION AND KEY RECOMMENDATIONS

Seafood consumption is a sensitive topic in Portugal and it is challenging to persuade decision-makers to take strong actions to address it. Current diet patterns are pushing the Earth beyond planetary boundaries, so addressing this subject in a constructive, positive and future-oriented manner is key. In Portugal and in the EU, there is political momentum and incentives to finally and effectively start tackling the issue.

Portugal's share of responsibility in the global problem of overfishing is not obvious because of its small population's size (10.29 million in 2019), but the government of the 'absolute champion' consumers in the EU making strong statements and taking actions to influence people's dietary choices for environmental reasons could inspire and influence other member states with high seafood consumption rates, such as Spain and Malta (EUMOFA, 2020), to pursue the same goals.

⁵²<https://www.publico.pt/2017/11/26/sociedade/ PergunTaserespostas/cantinas-escolares-quem-controla-o-que-pergunTas-e-respostas-1793661>

It is fairly unanimous among the experts that were interviewed that information and education are the basis of any desired shift of habits. Having acknowledged that the Portuguese seafood consumption habits can potentially compromise or contribute to the unsustainable exploitation of marine resources, all the respondents considered that the government should have a leading role in implementing a national, broad campaign communicating what are more sustainable choices and why. Stakeholders do diverge however on who should be responsible for developing and implementing such a campaign within the public administration. It was also raised the possibility of having retailers leading and funding this process.

The main findings of this work feed a number of recommendations concerning policies and effective approaches towards overcoming the barrier of addressing seafood consumption in Portugal:

R1. Recognizing the Portuguese as the highest per capita seafood consumption in the EU comes with the responsibility of inflicting considerable damage in the environment (not only because of direct overfishing and fishing by destructive methods, but also due to the carbon footprint). Therefore, consuming more diverse, sustainable and local seafood is not only a matter that concerns the Ministry of the Sea but also the Ministry of the Environment and Climate Action.

R2. Provide clarity and balance to consumers about why it is needed to have a more diverse, sustainable and locally-sourced seafood diet. From the three requirements – local, sustainable and diverse –, only the latter should come as new and it will be important to explain in which sense diversity and responsible consumption are linked. It is therefore important that these factors are always mentioned together to underline the complexity of choosing more responsibly and why none of them is enough alone (i.e.. choosing a species that was caught by the national fleet per se does not guarantee it is sustainable and vice-versa).

R3. A task force on sustainable seafood consumption should be formed. The Secretary of State for the Environment and Secretary of State for Fisheries should allocate human resources to lead the task force, creating the space for them to engage with stakeholders, organize and lead the meetings. It is important that this change is pushed by a ‘bicephalous’ leadership, which would illustrate that seafood consumption is not a matter that belongs purely to the ocean field of expertise but also to the environment and climate.

R4. Any of the initiatives suggested in this article should be funded by the public purse and monitored and evaluated by a third-party body.

R5. A national, broad, articulate and consistent informational campaign must be developed by marketing experts and implemented by, for instance, Docapesca, as the state-owned company that typically implements projects related to seafood consumption.

R6. Revise the ENCP 2020 to incorporate guidelines for the procurement of sustainable, local and diverse seafood and to include DRGM in the working group, which will allow the inclusion of these new species in the public facilities users’ routines. This would have a double consequence: on the one hand, being the government a major purchaser, it would have a real impact in the sales (in volume) of more sustainable choices, giving a positive sign to the retailers that are interested in making more sustainable seafood available in their facilities; on the other hand, it would allow these workers/students/users of public canteens to become more familiar with different species of seafood, increasing the chance of bringing the newfound habits into their households and personal habits.

Seafood consumption is a very complex topic that touches upon many different fields. Having a real impact on such an intricate area will most likely be achieved by taking a careful, systemic and strategic approach. It is important to recognize and make the best use of the fact that citizens have probably never been so willing to change their habits and to make some sacrifices for the sake of the planet. Their actions (whether by interacting or handling nature) have actual and unprecedented impacts on the environment – which ultimately impacts them – and that is the reason why governments should tackle sustainability in all its dimensions.

ACKNOWLEDGEMENT

This work resulted from the participation of the author in a training program of the Calouste Gulbenkian Foundation. The content and opinions expressed in this document are the sole responsibility of its author and do not necessarily reflect the policy or position of the Calouste Gulbenkian Foundation and its LEAP – Policy Development Initiative partners.

SUPPLEMENTARY MATERIAL

This article is part of a more detailed policy study that includes the positioning of ‘marine conservation’ in the Portuguese political agenda and how the COVID-19 outbreak provided a chance for implementing actions that aimed at increasing locally-sourced food. If you want to be granted access to the full study, please contact the author.

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The elephant-seal in the room: why and how to regulate marine genetic resources in Portugal

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ABSTRACT

The vast genetic richness of the oceans is an important source of wealth and commercial opportunities. Since the adoption of the Nagoya Protocol, efforts were made to determine how governments can regulate the access and benefit sharing of Genetic Resources while, at the same time, maximizing the integrity and sustainability of ecosystems. Four years after ratification of the Nagoya Protocol by Portugal, there are no records of efforts being made to understand why and how to make the Protocol regulating mechanisms work at a national level in a cost-effective way. Considering the increasing importance of marine genetic resources, this study looks at the opportunities and challenges of implementing the Protocol and provides the basis for an informed decision whether and how to establish a system for national regulation. The study revealed that, despite understanding the need for regulation, stakeholders are reluctant about slowing down processes. The study recommends setting up a pilot to first regulate the marine genetic resources by using an online platform that already exists and integrates various ocean-related state services. If the pilot works, it is recommended to create a one-stop-shop online platform that gives all necessary support to grant easy-to-get permits on all genetic resources.

Keywords: Marine genetic resources, Nagoya Protocol, access and benefit sharing, digital transition.

JEL classification: K32, K33, K11, K39.

RESUMO

A grande variedade genética dos oceanos é uma importante fonte de riqueza e de oportunidades comerciais. Desde a adoção do Protocolo de Nagoia, esforços foram feitos para determinar como os governos podem regular o acesso e a partilha dos benefícios decorrentes do uso dos recursos genéticos, maximizando, ao mesmo tempo, a integridade e a sustentabilidade dos ecossistemas. Quatro anos após a ratificação do Protocolo de Nagoia por Portugal, não existe ainda registos de se terem feito estudos para compreender porquê implementar os mecanismos de regulação do Protocolo e como fazer com que funcionem a nível nacional de forma eficiente e rentável. Considerando a importância crescente dos recursos genéticos marinhos, este estudo analisa as oportunidades e os desafios da implementação do Protocolo e fornece a base para uma decisão informada sobre se faz sentido estabelecer um sistema de regulação nacional e como fazê-lo. O estudo revelou que, apesar de compreenderem a necessidade de regulação, as partes interessadas estão relutantes sobre se irá desacelerar os processos. O estudo recomenda a criação de um piloto para primeiro regular os recursos genéticos marinhos usando uma plataforma online já existente e que integra vários serviços estatais relacionados com o oceano. Se o piloto funcionar, recomenda criar uma plataforma on-line que dê todo o suporte necessário para atribuir licenças de fácil obtenção para todos os recursos genéticos.

Palavras-chave: recursos genéticos marinhos, Protocolo de Nagoia, acesso e partilha de benefícios, transição digital.

Classificação JEL: K32, K33, K11, K39.

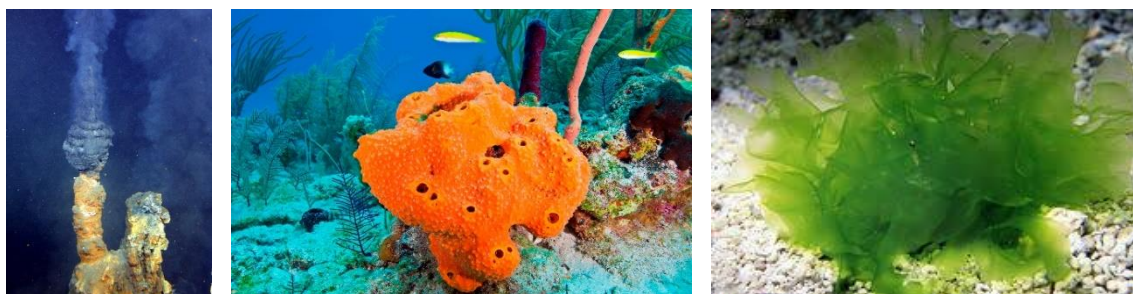
1. BLUE BIOTECHNOLOGY AND GENETIC RESOURCES IN PORTUGAL

Marine life has adapted to thrive in extreme ambient conditions (Rothschild and Mancinelli, 2001). The resulting vast genetic richness of the oceans is not yet fully known, which makes it extremely appealing to biotechnological studies (Munro et al., 1999; Martins et al., 2014). Blue biotechnology - the exploration and exploitation of marine organisms to develop new products - is considered one of the sectors with highest potential for sustainable blue growth (European Commission, 2016), and has now become an intrinsic part of modern life. The marine world is still under researched, which means that the potential of marine organisms that are not so well known to the blue economy, is only just beginning to be explored (Day et al., 2016; Ritchie et al., 2013).

Up to now, there is evidence suggesting that about 34,000 marine natural products could potentially be used in medicine, food and cosmetics (Heffernan, 2020). Some could even help combat viruses, such as the one responsible for the current pandemic (Zumla et al., 2016). Projections suggest that the global blue biotechnology market could reach \$6.4 billion by 2025 (Rapra 2015) and some scientists are now considering marine genetic resources, the “blue gold” (Bhatia and Chugh, 2015; Greer and Harvey, 2013).

Therefore, it is important to remember that genetic resources (GRs) - the genetic heritage with actual or potential value sourced from any organism – are a promising source of biotechnological applications with added value in several areas of science and industry, playing a significant and growing role both in commercial and non-commercial Research and Development (R&D) (Achterberg, 2018) (Fig.1).

FIGURE 1: LEFT - HYDROTHERMAL MICROORGANISMS USED IN PHARMACEUTICALS AND COSMETICS. | CENTRE - MARINE SPONGES, A RICH SOURCE OF BIOACTIVE COMPOUNDS, WITH MANY BIOMEDICAL APPLICATIONS. | RIGHT - GREEN ALGAE USED MOSTLY IN FOOD AND COSMETIC APPLICATIONS BECAUSE OF ITS ANTIOXIDANTS, ANTIMICROBIAL, ANTIVIRAL, AND ANTI-INFLAMMATORY PROPERTIES.



Source: left image: wikipedia.com | centre image: <https://www.dkfindout.com/us/animals-and-nature/invertebrates/sponges/> | right image: algaebase.org

The blue gold rush has increased the bioprospection activities in the marine areas, involving various collaborations, partnerships and joint ventures between institutes and companies (Bhatia and Chugh, 2015). With the increasing concern about ownership of GRs, there is a clear and critical need to ensure that the ocean genome is used in a sustainable, fair and equitable manner.

The great extension of the Portuguese Exclusive Economic Zone (ZEE) and the proposed extended continental platform (EMEPC, 2009) has great potential to hold unexplored GRs that can originate new products (Akdyf, 2014). This has naturally led to a recent investment in the development of the blue economy in Portugal (DGPM, 2014).

Bioprospecting and investigating GRs in Portuguese waters is a relatively recent activity, when compared to other areas of activity with relevance in the maritime space. However, despite the enormous competition and competitiveness in this activity, Portuguese companies have been performing well and winning international awards (PSOEM, 2019).

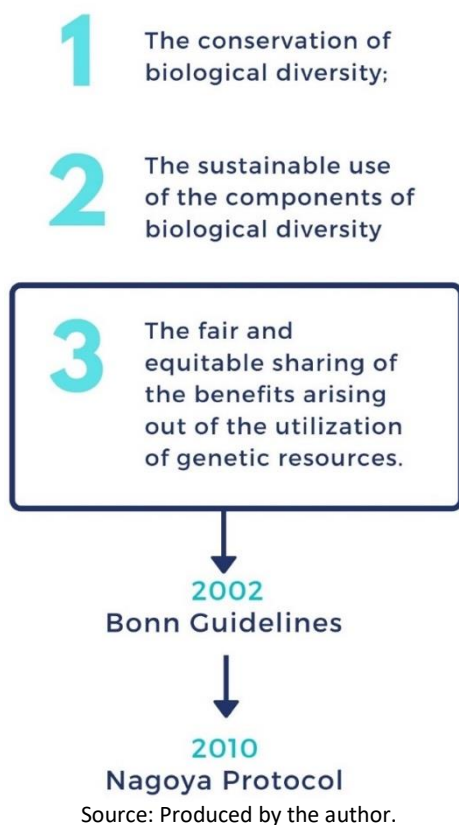
As this field evolves, governments, researchers and companies need to ensure that low- or middle-income countries benefit from their own marine genetic diversity, and that wealthier countries don't unfairly exploit these resources. Contracting agreements are taking the centre stage of such activities (Bhatia and Chugh, 2015) and countries with appropriate legal frameworks and clear guidelines not only ensure fair international collaboration, but also promote science and their bioeconomy, while creating predictable conditions that ensure sustainability of the processes.

2. LEGAL FRAMEWORK RELATED TO THE USE OF GENETIC RESOURCES

2.1. Convention on Biological Diversity and Nagoya Protocol

FIGURE 2: 3 OBJECTIVES OF THE UN CONVENTION ON BIOLOGICAL DIVERSITY AND THE TOOLS MADE TO GIVE EFFECT TO THE 3RD objective.

THE CBD HAS CURRENTLY 193 PARTIES AND ITS 3 PRIMARY OBJECTIVES ARE:



Global biodiversity is protected by the international Convention on Biological Diversity (the CBD), ratified in 1993 by Portugal through Decree No. 21/93 of 21st of June. To give effect to the third objective of the CBD (Fig.2), the article 15 recognizes that countries have sovereign rights over genetic resources on their territory. This article encourages to ease access to genetic resources as long as biodiversity is conserved and sustainably used, but also endorses that any benefits arising from the use of these resources should be shared with the providers.

However, many countries which are party to the CBD, including the member states of the European Union, did not considered this article sufficiently clear to be implemented into national law. In 2002, the first major effort was made to implement this provision, which was the Bonn Guidelines for access and benefit sharing (CBD, 2002). These were a collection of items that should be taken into consideration, but the guidelines were voluntary. Together with increasing cases of commercial use of GRs and growing interest on private ownership of products derived from GRs, there was a need for a more specific and legally binding agreement that led to the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization (in short, Nagoya Protocol or NP) which was adopted in October 2010 in Nagoya, Japan and entered into force on October 12, 2014 under the Decree-Law no 122/2017.

The NP applies to GRs accessed after 12 October 2014 in the 129 countries that have ratified the Nagoya Protocol (CBD, List of Parties). The Protocol requires both the member states and the users of the GRs within such member states to comply with several obligations when GRs from a specific country are used. There are three relevant factions to the protocol:

- I. The provider country - the country where genetic material is collected,
- II. The user country - the country where genetic material is used,
- III. The company/institution involved in collecting and/or using the genetic material.

Most of the world's most biodiverse regions are usually "providers," while "users" are more traditionally situated in richer economies.

The Nagoya Protocol requires that providers and users obtain, preserve and keep relevant documentation. Users and third parties need to be informed about terms of access and needed documentation and which benefits need to be shared when respective GRs or associated traditional knowledge is utilised.

2.2. Access and Benefit-Sharing (ABS)

The ABS concept is high on the agenda across the world (Drews, 2018), and it prescribes two contractual mechanisms: one contractual mechanism at the point of access to the GRs, the Prior Informed Consent (PIC), and another aimed at regulating the benefit-sharing arrangements at the point of time when they are being used, the Mutually Agreed Term (MAT) (SCBD, 2010).

- PIC: the permission given by the Competent National Authority (CNA) of a provider country to a user prior to accessing GRs, in line with an appropriate national legal and institutional framework, outlining the nature and the intended goal of the planned research and utilization.
- MAT: an agreement reached between the providers of GRs and users on the conditions of access and use of the resources, and the benefits to be shared between both parties, as well as further contractual issues.

The contractual mechanisms, seek to create predictable conditions and legal certainty for the use of GRs and intend to define the means for the sharing of benefits and the mechanisms of compliance, safeguarding against the plundering and misappropriation of GRs and ensuring that local communities benefit from the use of their biodiversity heritage.

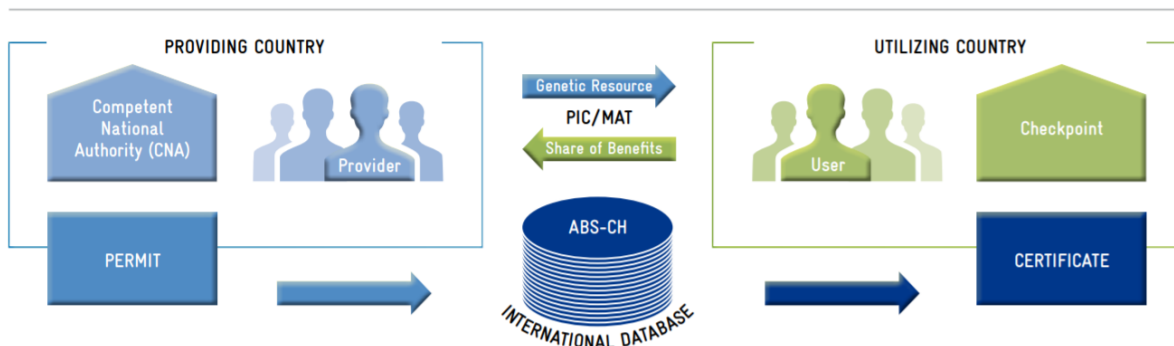
As a result, ABS requirements and procedures currently vary from country to country, depending on their approaches and aims (Union for Ethical BioTrade, 2016), the NP only provides some guidelines as to the system for enforcing PICs and MATs (Fig.3).

However, the article 15 does not specify a practical and legal way of implementing PIC/MAT in a country. It is the responsibility of each country that ratifies it to introduce their individual implementing procedures and practices.

Since ABS contract-law is a relatively new and unexplored area, it raises a number of technical and difficult challenges (Meléndez-Ortiz, 2014). Relatively few countries have adopted full, detailed regulatory requirements, and some of these have proven to have potential for improvement and are being reconsidered or revised (Young and Tvedt, 2018). It is up to the country to establish whether noncompliance results in strong action like criminal penalties, or lighter action like the loss of access to the GRs, cancellation of permits and/or research funding (Duke and Parsons, 2018).

FIGURE 3: DIAGRAM EXPLAINING HOW ABS PROCESS WORKS

THE COMPLIANCE PROVISIONS OF THE NAGOYA PROTOCOL ON ABS



Source: (Drews, 2018).

2.2.1. EU ABS Regulation

The NP was supplemented by Regulation (EU) No 511/2014 that brought the EU law in line with the Protocol and by the Commission Implementing Regulation (EU) 2015/1866 of 13 October 2015 that sets out the details regarding the monitor user compliance and best practices. EU Member States that have ratified the protocol are responsible for implementing the EU ABS Regulation which main provision is that users can only utilise genetic resources after submitting the due diligence declarations either on paper or via EU-wide web-based tool called DECLARE. The due diligence ensures that genetic resources were accessed in accordance with applicable ABS legislations/regulations and can legally be utilised. The CNA also uses DECLARE to transfer non-confidential information from the due diligence declarations to the ABS Clearing House, an international platform for exchange of all relevant ABS information between actors in different countries which are Parties to the Nagoya Protocol.

The due diligence declarations must be submitted by users to the CAN at two specific checkpoints:

1. At the stage of research funding, where research involves the utilisation of genetic resources or traditional knowledge (1st "checkpoint");
2. At the stage of final development of a product developed via the utilisation of genetic resources or traditional knowledge (2nd "checkpoint").

The implementation of the Protocol and in particular the provisions that govern due diligence clearly affect many users of GRs, including companies in various industry sectors, scientific research institutes and local communities. If an institution or company acquires, uses or supplies GR it is likely to fall under ABS legislation or regulations in the country where the GR came from, the country where it is based, and countries to where it supplies GRs of their products (Lyal, 2017). This process of verification of compliance may consist of handling different stages of the product development process (e.g., obtaining biological material, collaboration with third parties, patent filing and commercialization) and the research process (e.g., sampling, ownership of collections and declaration of origin of samples) (Covington and Burling, 2019).

Therefore, it is encouraged that member States develop their own national systems for users to submit due diligence declarations. Those systems will generally be linked with DECLARE. It is up to the national governments to determine the internal control procedures and to establish the applicable sanctioning regime.

2.2.2. ABS beyond national Jurisdiction

As far as marine resources are concerned, the current protocol only covers waters within national jurisdiction. However, there are currently on-going negotiations about the Nagoya protocol extension (Heffernan, 2020) to regulate genetic resources in international waters beyond national jurisdiction. According to the resolution 72/249 of 24 December 2017 (Assembly, 2017), the CBD decided to convene an Intergovernmental Conference to develop an international legally binding instrument on the Law of Sea on the conservation and sustainable use of marine biodiversity of areas beyond national jurisdiction (BBNJ), with a view to develop the instrument as soon as possible.

Conservationists and scientists have pushed for a high-seas treaty for more than a decade, and negotiators were scheduled to start the fourth and final round of talks on 23 March of 2020 in New York, but that meeting has been postponed until further notice because of the COVID-19 pandemic (Heffernan, 2020). The treaty will close a giant gap in the existing network of international and national laws.

2.3. The Nagoya Protocol in Portugal

Portugal has gathered knowledge and resources to be at the forefront of ocean biotechnological exploration (PSOEM, 2019). This is an area supported, almost exclusively, by a strong R&D component and the objectives of national policy are directed towards the development of new patents and the promotion of the commercialization of applications and products and the fair and equitable distribution of the benefits arising from their use (PSOEM, 2019).

Recognizing the need to ensure access to GRs as the basis for biotechnological R&D, and the fair and equitable sharing of the benefits arising from its use, Portugal approved the Nagoya Protocol, within the scope of the CBD, through Decree No. 7/2017, of 13 March. From the moment Portugal ratified

the protocol, each user must exercise “due diligence” through the process described in 2.2.1 to ensure that the genetic resources and traditional knowledge associated have been accessed in accordance with applicable legal requirements. However, it has been recognized by the ministry of the sea that the laws of access and the obligations of those who intend to benefit from such genetic resources, must be clarified (DGPM, 2021).

Implementing measures were provided through Decree-Law no. 122/2017, of 21 September, legislation which comes to give national framework to the provisions of the EU regulations. This Decree-Law determines that the Portuguese CNA is the Nature Conservation Institute and Forestry (ICNF) and declares that the competent authorities of the Autonomous Region of the Azores and Autonomous Region of Madeira should be designated by regional authorities. It also determines the creation of an ABS Advisory Group to support the CNA in the application of this decree-law and the EU Regulation. According to the Decree-Law, the Advisory Group should meet once a year and extraordinarily whenever the CNA summons it. It also identifies the monitoring and control measures in the national territory, it establishes the procedures for the registration of collections, and it is determined the sanctioning regime applicable to non-compliance with the European Regulations.

However, this Decree-Law was never taken into action. To the present date, monitoring and control measures were only established in the Azores Autonomous Region (SCBD, 2015). As for Mainland Portugal and Madeira Autonomous Region, is still to be considered whether to establish national requirements for access to GRs in the light of the NP (SCBD, 2015).

2.3.1. Regulatory framework of the Azores Autonomous Region

The Azores Autonomous Region, which has its own government and autonomous legislature within its own political-administrative statute, has since 2012 opted to regulate the legal regime on access and use of Azores natural resources through Regional Legislative Decree n.º 9/2012/A of 20 March, including the genetic resources applying principles of the NP (Calado et al., 2011).

This Regional Legislative Decree n.º 9/2012/A was recently altered by the Regional Legislative Decree no. 17/2020/A of 20 March aiming at simplifying some administrative procedures.

2.3.2. Regulatory framework of Mainland Portugal and Madeira Autonomous Region

Difficulty arises when the State is silent regarding access requirements – that is, when it is not expressly stated whether PIC/MAT is required. This is the case for Mainland Portugal and Madeira, where the decision whether to regulate ABS of GRs has not yet been made and it is not on the political agenda.

Despite of ICNF helping users to exercise due diligence, it is not currently working on why and how establish a national ABS framework.

There were some initial efforts to implement the legislation however, due to limited financial resources, limited human resources and organizational capacity, this process is paused ^{1,4}. ICNF is only responding to requests of international entities that seek to understand if the submission of PIC is mandatory, which is not the case. ICNF is waiting for staff reinforcement to fill some of the gaps and be able to follow-up on this matter.

To the ICNF, this decision is not a pressing issue because, according to the Paragraph 1 of the Article 6 of the NP, the protocol leaves it to the providing Party to decide whether PIC/MAT shall be required or not (Greiber, 2012).

This gives the State a number of options:

- I. to demand regulation in all cases of access,
- II. to demand regulation for access to certain types of GRs,
- III. to demand regulation for access to GRs for particular purposes, or;
- IV. to fully exempt regulation in all cases of access.

However, the stakeholders that need to get access to GRs at a daily basis, are concerned about this inaction and worry that the decision will not represent their interests.

3. NATIONAL STAKEHOLDERS PERSPECTIVES AND CONCERNS REGARDING ABS OF MARINE GENETIC RESOURCES

To date, no national research has been undertaken to inform decision makers about the relevance of establishing regulation at a national level. Considering the increasing importance of marine GRs and the growing number of countries implementing the Nagoya Protocol, it is urgent to listen to the stakeholders' perspectives and concerns regarding regulation of access to marine GRs and benefit-sharing. Only this way it will be possible to make an informed decision based on the real-life needs of the stakeholders that will be dealing with this policy framework.

To do so, 32 stakeholders were interviewed – 23 have active roles in blue biotech R&D activities and 9 are regulatory bodies that are, or can be, involved in the establishment of PIC/MAT requirements. The data consisted of interview transcripts that were coded and further analysed as qualitative data, literature, websites and e-mail correspondence. The cases interviewed are not representative of all stakeholders affected by this situation, however they were identified as the ones that are being most impacted with the current lack of regulation of the GRs in mainland Portugal and that will be most impacted with this decision, regardless of the resolution.

Therefore, the following section should be taken into consideration before the decision on whether to proceed with such regulation at a national level.

3.1. Evidence of compliance and communication

Because Mainland Portugal and Madeira Autonomous Region do not currently grant PIC and/or MATs, the ICNF cannot issue the international certificate of compliance to the user of GRs that sampled in Portugal. Some companies and R&D institutions worry they will not be able to proof compliance in the checkpoints mentioned in 2.2.1 in European funding mechanisms or in any other moment of need. Some of them are worried about future regulation having retroactive effects for past procedures related to the use of GRs^{53,54,55}.

These concerns confirm that there is a clear lack of communication between stakeholders and ICNF, that has the mission to inform stakeholders that:

1. ICNF can issue a document stating the GRs and associated traditional knowledge have been accessed and are being utilized in accordance with national regulatory requirements. Currently this document can prove that Portugal, despite of being a Party to the NP, is not under PIC/MAT requirements, and that exercising due diligence is enough to be compliant with national rules.
2. Future ABS regulation can never have retroactive effects on procedures occurred before regulation implementation.

The Article 13 of the CBD directs the Parties to promote and encourage understanding and develop education and public awareness programs. Portugal has carried out some seminars and meetings across the country (SCBD, 2015). However, considering the different stakeholders' contributions and apprehensions, both companies and R&D institutions showed concerns about the lack of clarity and encouragement of the competent authority when it comes to the process of obtaining access to GR, underlining the lack of efficiency in communicating relevant information on their website^{32,33,34,56,57,58,59}.

There is consequently a general lack of legal certainty of users that manage GRs and a lack of knowledge on how to deal with ABS rules, specially how and when to make benefit sharing agreements, that are increasingly required at an international level^{34,36,60,61} showing a clear communication gap between stakeholders and ICNF.

3.2 Safety and competitiveness

⁵³ Interview with CEO of R&D company Biotrend

⁵⁴ Interview with researcher of R&D Institution CESAM

⁵⁵ Interview with researcher of R&D company Oceano Fresco

⁵⁶ Interview with researcher of R&D Institution MARE

⁵⁷ Interview with CEO of Company Flying Sharks

⁵⁸ Interview with CEO of R&D ex-company Bioalvo

⁵⁹ Interview with researcher of R&D Institution CIIMAR

⁶⁰ Interview with CEO of R&D company Necton

⁶¹ Interview with co-founder of R&D company Sea4Us

This legal uncertainty is caused by lack of awareness, capacity, knowledge and skills to negotiate the complex terms of the bioprospecting contracts. The stakeholders need to be fully aware of all relevant laws and certain that they are predictably in force and enforceable. Without legal certainty, it is difficult for partnerships to develop between users and providers (Laird, 2013) and ends up compromising the business safety. In turn, some users develop preventive measures that are more time consuming and less efficient than having a national system in place to get access to the submitted due diligence declarations and PICs whenever they need them^{32,33}.

It might also be assuring for researchers to work on R&D companies and institutions that know how to deal with PIC/MATs and have certificates of compliance ^{62,63 64,65,66}. There is concern that if a project does not have all the foundations, including proof of compliance with sustainable and fair practices it will decrease the probability of the decision to receive public funding, to invest or create partnerships ^{42,45,67}.

The study findings reveal divergent opinions whether ABS requirements bring a competitive advantage or not. The opinions vary largely across different sectors of the blue bioeconomy.

Cosmetic companies are currently requesting evidence of legal compliance from Portuguese suppliers of biological material^{68,69} because it is a competitive advantage for a brand to have associated certificates of sustainable and fair business⁴⁷. This corroborates previous studies that have shown this sector is generally more inclined to support the need to sign agreements and share benefits (Kang et al., 2015), avoiding legal and reputational risk in the country where it commercializes the product⁴⁷.

Industries like cosmetics, nutraceuticals and novel foods, are industries that appear to be more likely to embrace the use of marketing techniques to emphasise fair uses of traditional knowledge relating to natural plant-based or even animal-based products (Laird, 2013). Once a brand has certificated products, it leads other brands from the same sector to follow.

Pharmaceutical companies seem more reluctant to the processes of ABS⁷⁰, arguing that it will bring unnecessary paperwork, more bureaucracy, and that it can be detrimental to business if their investors have to share benefits with the country of origin and prefer to invest in competitors that do not have ABS rules.

Other sectors, however, such as food and beverage and botanicals, which use a vast range of ingredients from many different suppliers, have not fully grasped the legal and ethical obligations that arise from the protocol and rarely see these requirements as relevant to their business model. This is slowly changing, as governments introduce laws that require ABS compliance before access to GRs is permitted (Laird, 2013).

Additionally, some stakeholders mentioned frequent concerns about entities, mainly big companies, preferring to collaborate with countries with active regulation frameworks ^{41,45,46,47,48}, with safer ABS agreements.

The study did not found organizations having been subject to penalties for noncompliance yet, but five years after the entry into force of the Nagoya Protocol, authorities might already have built up their internal capabilities and design an effective regulation plan and checking compliance, that organizations cannot afford to fail.

3.3. Efficiency of regulation and enforcement

Although the NP may increase legal certainty and traceability (Laird, 2013), there are indeed concerns about the protocol negatively affecting the user performance, leading to increased costs and complexity of obtaining GRs (Kang et al., 2015). In another hand, the relatively high costs, lack of clarity and complexity of ABS procedures have the potential to result in non-compliance (Day et al.,

⁶² Interview with researcher of R&D Institution CESAM

⁶³ Interview with researcher of R&D company MARE

⁶⁴ Interview with researcher of R&D Institution Oceano Fresco

⁶⁵ Interview with researcher of R&D Institution IMAR

⁶⁶ Interview with researcher of R&D Institution CIIMAR

⁶⁷ Interview with CEO of R&D company Biotrend

⁶⁸ Interview with CEO of R&D company SeaExpert

⁶⁹ Interview with CEO of R&D ex-company Bioalvo

⁷⁰ Interview with researcher of R&D Company Sea4Us

2016), like is the example of Kenyan ABS legislation that creates hurdles to access rather than facilitating it (Kamau, 2009).

The general opinion of the stakeholders is that if Portugal is a signatory of the NP, there should be an effort of allocating the necessary human resources for a regulation process that is time- and cost-efficient. If the ABS permitting system and administrative processes are not efficient, most stakeholders say that It might be better to not regulate, than to poorly regulate and slow down processes^{71,72,73,74,75,76} like for example slow down the international response to infectious diseases, and to research (Bruins, Marcel, 2017).

The main difficulties alleged by EU Member States in relation to the establishment of this administrative framework have been (Movilla Pateiro, 2020):

- The reluctance of some administrations and agencies to take on the new tasks required by the EU ABS Regulation;
- The difficulty of identifying the appropriate responsible authorities and of establishing cooperation mechanisms between the different institutions involved; and
- The lack of knowledge and expertise related to the still recent EU Regulation.

These obstacles are probably the reason why some researchers say it has been difficult to get permits to work in some nations, where it takes too long to receive a permit and slows down the research^{77,78,79}. In another hand, some national researchers are confident that an effective administration framework can bring more benefits than burdens^{49,55,80} (Heffernan, 2020).

The question is whether there are the necessary means to actually implement the administration framework and to enforce the regime they are constructing. Determining penalties for violation sufficiently severe to bring people to cooperate is important however, the actions of enforcement from authorities are so far not the main driver of companies implementing Nagoya compliance. Instead, as shown before, requests from business partners frequently prompt companies to take action regarding access and benefit-sharing rules (Covington and Burling, 2019).

Additionally, if an ABS regime is relatively welcoming and easy-to-use to applicants, then the incentive of a stakeholder to bypass the system decreases⁸¹. It should also be borne in mind that improving the treatment of information, reducing bureaucracy and dematerialisation of procedures and documents are unavoidable matters in the future that are being solved with digitalization. The continued digitization of processes and documents is already guiding the evolution of Portuguese governing bodies.

The study shows that Portugal is quite advanced in digitalization processes, especially the Directorate-General for Natural Resources, Safety and Maritime Services (DGRM), that has analysed and diagnosed all services related to the sea (170 services that were before spread through 4 different applications) and created a single platform called BMar⁶⁰ to manage those services and to facilitate interactions with citizens, professionals and companies. With this platform, Portugal became one of the first countries in the world to provide electronic maritime certificates. If such system is already in place and is easy-to-use, the NP permits could be issued through the same system or similar ones⁶⁰.

⁷¹ Interview with researcher of R&D Institution CESAM

⁷² Interview with CEO of company Flying sharks

⁷³ Interview with researcher of Coimbra University

⁷⁴ Interview with project manager of FCT

⁷⁵ Interview with CEO of R&D company Necton

⁷⁶ Interview with co-founder of R&D company Sea4Us

⁷⁷ Interview with researcher of R&D Institution CIIMAR

⁷⁸ Interview with researchers from University of Vigo

⁷⁹ Interview with researcher of R&D Institution CCMAR

⁸⁰ Interview with researcher of R&D Institution MARE

⁸¹ Interview with officer of DGRM

3.4. Human resources and fair cooperation

The government commitments may be not translated into practice because of insufficient funding, inadequate government resources, limited capacity of government staff or simply because it is not in the political agenda.

The study finds that the national CNA and other administration institutes are in agreement that there is a lack of human resources for an action plan for the implementation of the Protocol^{82,83,84} and that the follow-up of this issue is not in the political agenda.

Some interviewed stakeholders that work in non-government entities have the opinion that if there is indeed lack of government resources, there are only benefits in asking for help^{85,86}. There is however a divergent opinion concerning whether it should be implemented a system of cooperation between different types of administration bodies. Considering the lack of human resources in the CNA to take action, it was often mentioned the suggestion of dividing the procedure between different regulation bodies, by making the ocean regulatory body, DGRM, in charge of processing the requests to access to marine GRs and other administration bodies would be in charge of other types of GRs^{64,65,87}. These suggestions were supported by the information that there is much higher demand of marine GR than other types of GR, both in mainland and the Azores⁶¹. However, the NCA referred that, by experience, there are often complications when the process is not centralized, adding a layer of complexity following lack of communication⁶¹.

In another hand, when an ABS regime is based on a centralised agency, it facilitates enforcement to a large degree as the agency can be reasonably certain that if there is any activity that it does not know about, then it must be illegal. However, a similar effect can be achieved by having a centralised digital portal that gathers information on all requests for access to GRs. Following the trend of digitalization and lack of human resources in the administration, the construction of an easy-to-use digital platform seems a desirable and effective option for most stakeholders^{63,64,65,66,88,89,90}.

This idea is currently being adopted by the Regional Directorate for Science and Technology (DRCT), the entity responsible for the Nagoya Protocol in Azores, as they created an online form for any user that wants to get access to a natural resource in the region. When designing the form, they consulted the other departments to adjust the online form to collect the information needed to grant other licences in a centralized way. If the regulation is decentralized, DRCT is of the opinion that, as long as the respective entities pass on the information, the process works good¹⁸, however DRCT says that “It would be very interesting to have a single portal at the national level, something like Balcão Portugal 2020, that also has a subsection of 2020 Azores, but within the same single portal”.

The platform can also be a vehicle to build capacity of the staff of R&D companies and institutions about ABS processes since there is often lack of internal staff with sufficient knowledge on that^{65,66,67,91}.

Additionally, cases of illegal access, misappropriation or Biopiracy are still occurring in various countries and communities, especially in Latin America, Asia and Africa, and it has been difficult to find cost-effective legal solutions within the framework of national ABS legislation. Again, if the process of requiring access to a certain GR is made simple and easy-to-get, there will be more users encouraged to comply.

Most stakeholders are aware of cases or can think of potential situations where foreign entities come to Portuguese waters exploring the marine GRs with no report or sharing of benefits to Portugal, which might lead to unfair appropriation of national marine GRs that can jeopardize the national sector interests^{92,93,94,95,96}. Some companies can take advantage of the current lack of regulation by,

⁸² Interview with NP focal point of ICNF

⁸³ Interview with officer of DGPM

⁸⁴ Interview with officer of DGRM

⁸⁵ Interview with researcher of R&D institution CESAM

⁸⁶ Interview with researcher of R&D institution CIIMAR

⁸⁷ Interview with CEO of ex-company Bioalvo

⁸⁸ Interview with researcher of R&D institution MARE

⁸⁹ Interview with researcher of R&D institution IMAR

⁹⁰ Interview with CEO of R&D company SeaExpert

⁹¹ Interview with researcher of R&D company Oceano Fresco

⁹² Interview with CEO of R&D company Biotrend

⁹³ Interview with researcher of R&D institution CESAM

⁹⁴ Interview with researcher of R&D institution IPMA

for example, getting access to species that are also present in a regulatory country, but they chose Portugal because they can bypass legal obligations.

ABS mechanisms could help trained scientists form collaborations, contribute to the conservation of the biodiversity on which their work depends, and enrich the lives of the local people and local researchers that have been responsible for taking care of the GRs for generations (Meléndez-Ortiz, 2014; Duke and Parsons, 2018). Foreign scientific expeditions, for example, have shared data and expertise with Azores scientists and communities, which has allowed them to improve their national knowledge about their resources⁹⁷.

3.5 Traceability and sustainability of biological resources

The study shows that due diligence is most commonly issued to foreign entities that contact ICNF to ask what are the legal requirements of the country, whereas the national entities are less concerned in reporting the access because they are unsure whether it is mandatory and how to proceed.

The lack of regulation limits traceability of the national and international use of Portuguese GRs and therefore limits the government capacity to make informed decisions about the sustainable management of the species that hold commercially appealing GRs^{71,72,73,74,75,98,99}. Assigning unique identifiers to all samples or collections containing marine GRs and map them on an online database, could be a solution to this problem.

There are some other aspects that are not always considered, like for example national institutions that maintain an ex situ collection of samples containing the national genetic heritage; The sharing of the information associated would be maximised if it could be regulated, not only to map which Portuguese GRs are in national or international labs and collections⁷⁴, but also to share the benefits of the utilization of such GRs⁷⁵.

The study results were divergent when it comes to the impact that the lack of regulation is having on the sustainability of the biological resources. Some say that on mainland there is no GR that is sufficiently unique to compromise its sustainability^{100,101,102,103}.

Others say that some types of bioprospection demand periodic sampling, and worry that could negatively impact the ecosystems^{73,76,78}. Others have the opinion that in order to safeguard the future of a species with commercially appealing application, first it should be implemented a system of quotas and sanctions for commercial suppliers¹⁰⁴.

After taking into consideration the real-life concerns of the stakeholders, it is also important to study cases that have already a regulatory system in place.¹⁰⁵

4. CHALLENGES AND LESSONS LEARNED FROM THE REGULATORY FRAMEWORK OF AZORES

The study results presented a clearer picture of why and how the Azores are regulating Genetic Resources. Azores is a region with a vast biodiversity, with great potential for R&D. The maintenance of the unique characteristics of Azores natural capital were the basis for the strategic option to develop a legal instrument which demands regulation of all natural resources, including the genetic resources¹⁰⁶.

As mentioned before, every researcher or any other user that wants to get access to a natural resource of the Autonomous Region of the Azores, must request authorization through an online form⁸⁵.

⁹⁵ Interview with CEO of R&D ex-company Bioalvo

⁹⁶ Interview with researcher of R&D institution CIIMAR

⁹⁷ Interview with officer of DRCT

⁹⁸ Interview with officer of FCT

⁹⁹ Interview with CEO of R&D company SeaExpert

¹⁰⁰ Interview with researcher of R&D institution MARE

¹⁰¹ Interview with CEO of company Flying Sharks

¹⁰² Interview with CEO of R&D company Necton

¹⁰³ Interview with researchers from University of Vigo

¹⁰⁴ Interview with co-founder of R&D company Sea4Us

¹⁰⁵ Interview with head of Ocean Division, Ministry of International Affairs

¹⁰⁶ Interview with NP focal point of ICNF

The form was created in 2013 and asks for detailed information about the institution and the team that wants to get access to the resource, but also asks for the type of natural resource to be sampled and the research project details, including the methodologies and expected outcomes as well as types of benefits. If the user wants to get access specifically to the GRs, it should be mentioned. When the form is submitted, the DRCT checks with other regional departments if there are any other licences needed for the access to the natural resource, like for example a license to enter a marine protected area if it is the case. This process was developed to optimize the process of granting permission to access the resources: instead of submitting several orders to different departments, it is only necessary to submit the order once on the online form. The submission of the form should be sent 45 days before sampling. Once the request is processed by DRCT, the PIC is formalized, and the authorization is granted.

Access can be granted according to the regulatory rules of the Regional Legislative Decree no 9/2012/A of 20 March and the Regional Regulatory Decree n.º 20/2012/A, of 5 November. However, this legislation was undergoing some changes in the regional parliament during the period of the study.

4.1 Changes to the Regional Regulatory framework

With the limited available human and technological resources, DRCT was not being able to operationalize all the steps that were in the regional legislative and regulatory decree since 2012. Therefore, the operationalization was being limited to the first step that was issuing a PIC. The legislation demanded other steps, like the attribution of a unique identifier, which was never carried on. The unique identifier would be a reference for each collected sample that would allow not only to mention the sample in scientific papers but also to map which samples were actually used for research and where they came from. According to legislation, this number would be also used to assign a certificate of compliance, which intended to be a proof that the sample collection was according to legislation and had met all requirements. Because the methodology to assign the unique identifier was never defined, this process was never established.

Also, companies with regional commercial intermediaries like SeaExpert, that harvests seaweed from the Azores and sends them to foreign companies that use their GRs for cosmetics, realized that the regional regulation was only focusing on access to natural resources for scientific purposes. This made DRCT realise there was a gap in the regional legislation at this level. Because the international clients of these commercial entities were asking for legal documentation on access and benefit sharing, they urged the regional government to change the legislation and make it cover activities for commercial purposes.

As a result, they made the first alteration on 30 of March 2020 through the Regional Legislative Decree No. 17/2020/A to include activities for industrial and commercial purposes and to make the processes simpler, revoking many articles of the original legislation. The unique identifier process was revoked in the new legislation and instead, each user must use the reference on the Internationally Recognized Certificate of Conformity (CCIR). Every user must now obtain a CCIR to get access to the natural resources, replacing PIC. The legislation also safeguards that, if an involved Azorean entity wants a sample of the natural resource sampled, or part of it, the CCIR holder must proceed with the transfer.

To solve most of these problems, DRCT wanted to create a single platform that would allow the operationalization of the missing steps and be a one-stop-shop for making the access request and annex the necessary permits and licences, via computer, facilitating the responsiveness and speed of the process. DRCT reported that has held several meetings to make procedures more agile and quick based on the creation of this platform and it was in their agenda for 2/3 years, however, it was not possible to proceed due to lack of funding¹⁰⁷. Without the platform, it would require the creation of a new department, to regulate, monitor and verify compliance of the current complex legislation and has a result, the legislation has been changed.

According to DRCT, despite of not being able to implement all steps of the previous legislation, the process never limited the research community and up to now, authorization to access GRs has always be given.

¹⁰⁷ Interview with officer from DRCT

4.2. Benefit-sharing of Azores Genetic Resources

The study reveals that the establishment of MAT in the Azores was never endorsed. Although it never happened, in an eventual sample with economic potential, the current legislation safeguards the possibility of Azores to request a MAT, at any time, and this information is written in the authorization granted to access the GRs.

In some cases, there has been the opportunity to include regional researchers in the sampling process but there was never the need to establish a formal MAT, since it was also beneficial for the foreign users to have onboard an experienced local researcher and until now foreign users cooperate without legal enforcement. This is a good example of a non-monetary benefit, since the benefit here is the knowledge transfer from the foreign user to the regional researcher.

5. CHALLENGES AND LESSONS LEARNED FROM REGULATORY FRAMEWORK OF SPAIN

In Spain, one CNA and nineteen Regional Competent Authorities were established with different Roles when the Protocol was ratified in 2014 (Martins et al., 2020). This complex structure together with lack of online and dematerialized mechanisms, is considered by the research community not the best strategy, causing efficiency problems that slow down processes^{108,109}. The CNA is the Ministry for the Ecological Transition, responsible for providing the PICs and negotiating the MATs. However, different departments are taking care of different GRs. The marine GRs are the responsibility of the Directorate-General for Sustainability of the Coast and Sea of the Ministry for the Ecological Transition.

Spanish users need to ask for access through the electronic headquarters of the Ministry for the Ecological Transition and not directly to DECLARE¹¹⁰. However, foreigners need to ask for permits via e-mail. All users receive the permits via email and they are required to have them printed, signed and sent by post mail. Despite of the two checkpoints established by the EU mentioned in 2.2.1, Spain added one to its legislation (Article 14.3, Royal Decree Law 124/2017). The third checkpoint is related to the users of GRs when applying for a patent (Martins et al., 2020) where they have to present the necessary legal documents.

The regulation is only done for non-commercial uses. Spanish research institutions are working on recommendations to make the process more effective. Because the process is not yet dematerialized, the government needs a lot of resources and staff to make it work and it is difficult to trace down all the processes. If the users lose the permits, they are required to ask for another, which is time-consuming. In conclusion, the interviewed stakeholders have the opinion that it is difficult to see the direct benefits of the implementation of the regulation in Spain on the current terms because there are not effective mechanisms.

However, Spain is encouraging the development of codes of conduct, model contractual clauses for MAT, guidelines, and best practices, in line with Article 13 of Regulation ABS. Additionally, through Article 11 of Royal Decree 124/2017, Spain created the state information system on access and use of GRs and associated Traditional Knowledge, with the objective of coordinating information regarding both access to Spanish GRs and the use in Spain of GRs (Martins et al., 2020), which allows to map the Spanish GRs and help being aware of the international interest.

6. POLICY OPTIONS

Drawing on the findings and the documentation conducted, regulating GRs can bring benefits to stakeholders only if the process is effective for both the users and the entities that regulate the access and benefit sharing.

To reach such objective, the creation of an online platform to request and grant PIC/MAT in a online and dematerialized process has proved indispensable for a cost-effective implementation of the Nagoya Protocol at a National Level, including Azores and Madeira Autonomous Regions.

Therefore, the decision makers can address this problem with the following policy options:

¹⁰⁸ Interview with researchers from University of Vigo

¹⁰⁹ Interview with researcher of R&D institution CCMAR

¹¹⁰ Interview with researchers from University of Vigo

1 - Maintain the current policy situation – no regulation on access and benefit sharing of GRs in mainland Portugal

It is predicted that in this case:

- There will be no bureaucracy to get access to the GRs and no legal mechanisms to share benefits;
- There will be no cost-efficient system to obtain a certificate that proofs the sustainable, fair and equitable use of GRs;
- There will remain no knowledge on what is happening to the national GRs, which can not only limit innovation but also negatively impact the management and conservation of Portuguese GRs;
- Governments, researchers and companies will remain with no guidance on how to navigate ABS measures in Portugal in times of fast scientific and technological developments and will lack the tools that provide legal certainty and mutual trust in international collaborations;
- No incentive for the participation of local researchers in local expeditions conducted by foreigners.

2 - Regulate the access and benefit sharing of GRs in mainland Portugal without an online platform.

It is predicted that in this case:

- There will be high level of bureaucracy that requires users and providers to deal with plenty of paperwork and the process will be time-consuming, with higher risks of losing important documentation;
- The PIC requests to access marine GRs will be processed by national and international users and there will be guidance for efficient agreements on MATs;
- The providers of GRs can determine whether to make a MAT agreement, based on the guidelines provided by the CNA via email or website;
- There will be tools to negotiate the participation of local researchers in local marine expeditions conducted by foreigners;
- Increase of knowledge on which marine GRs are most relevant and interesting to researchers and industry, but difficult to make it public;
- Need to hire a big number of human resources for administrative processes.

3 - Introduce the necessary modifications in the existing online platform BMar to regulate access and benefit sharing of marine GRs by national and international users.

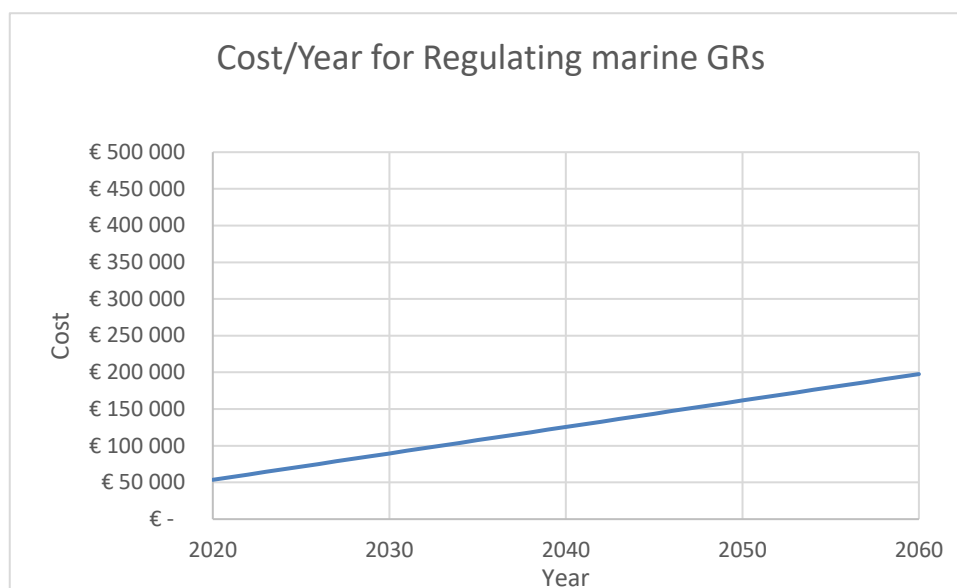
It is predicted that in this case:

- There will be no substantial bureaucracy because the process will be intuitive and the permits will be dematerialized;
- The requests to access marine GRs will be processed by national and international users and there will be guidance for efficient benefit-sharing agreements;
- The providers of marine GRs can determine whether to make a MAT agreement, based on the guidelines provided in the platform;
- The CNA will have to cooperate with another public administration institution;
- Higher legal certainty and transparency for the national Blue Bioeconomy Sector;
- Stakeholders reduce administrative burden and have higher support from online services
- There will be easy to access tools and best practices on how to negotiate the participation of local researchers in local marine expeditions conducted by foreigners;
- Increase of knowledge on which marine GRs are most relevant and interesting to researchers and industry;
- Low cost-benefit to the government since there is already in place an administrative framework in the BMar platform. In the scenario of other platforms from other

administrative bodies adopting the same modifications, the decentralised mechanism may cause entropy and have higher cost-benefit than having a unique platform (Fig. 4);

- It will be easier to address the possible decision of implementing ABS beyond national jurisdiction since the mechanism of ABS will be functional;
- There will be greater trans-border justice with equal rights and duties in the marine space.

FIGURE 4: ESTIMATION OF THE COST PER YEAR OF ISSUING PIC/MAT TO USERS OF MARINE GRs. ACCORDING TO DGRM, THE AMOUNT NEEDED TO PROCESS PIC/MAT INTO THE BMar PLATFORM WOULD BE 50 000 EUROS. IT WAS ASSUMED THAT THE ALLOCATED HUMAN RESOURCES WOULD COST 6000 EURO PER YEAR.



Source: Auto elaboration based on the estimation of the cost per year of issuing PIC/MAT to users of Marine GRs. According to DGRM, the amount needed to process PIC/MAT into the Bmar Platform would be 50.000 euros. It was assumed that the allocated human resources would cost 6.000 euros per year.

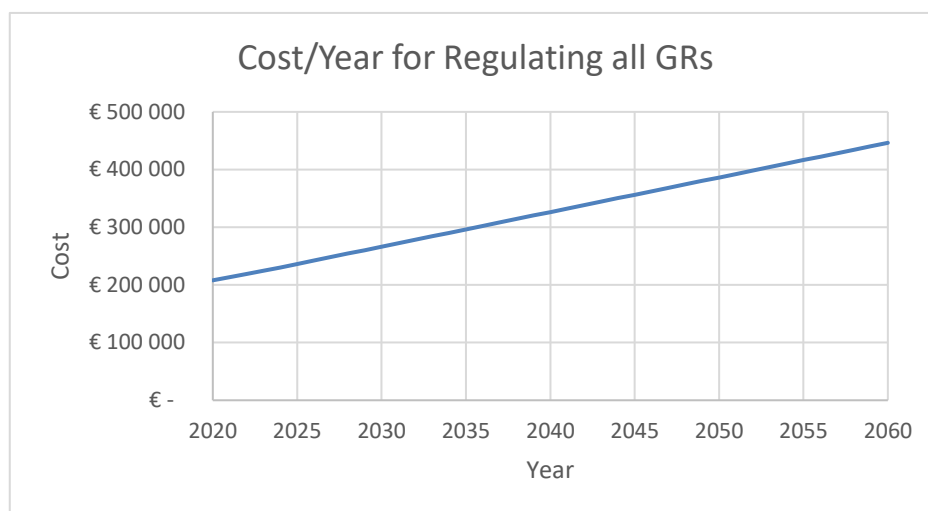
4 - Regulate access and benefit sharing of all GRs by national and international users through a unique online platform.

It is predicted that in this case:

- There will be no substantial bureaucracy because the process will be intuitive and the permits will be dematerialized;
- The requests to access all GRs will be processed by national and international users and
- The process would be centralized by the CNA, which will have full control to change the process or require improvements, with the collaboration of the designated ABS Advisory Board;
- Higher legal certainty, transparency, and environmental and socio-economic benefits for all national Bioeconomy Sector;
- There will be easy to access tools and best practices on how to negotiate the participation of local researchers in marine or in-land sampling conducted by foreigners;
- Increase of knowledge of which GRs are most relevant and interesting to researchers and industry;
- Medium cost-benefit to the government. It may be expensive when thinking short-term – with an initial investment of 200 000 for the creation of a unique platform - but will bring long-term benefits – since this centralized process will produce the desired outcomes to all target groups (Fig.5);
- It will be easier to address the possible decision of implementing the BBNJ instrument since the mechanism of ABS will be functional;

- There will be greater trans-border justice with equal rights and duties;
- There will be a clear understanding of the NP and the ABS mechanisms, by having a section in the platform dedicated to best practices, where it is clearly defined the rights granted as well enunciated the mandatory provisions and conditions that must be included within the MATs.

FIGURE 5: ESTIMATION OF THE COST PER YEAR OF ISSUING PIC/MAT TO USERS OF ALL GRs. ACCORDING TO DGRM THE AMOUNT NEEDED TO CREATE A NEW PLATFORM WITH BMAR FUNCTIONALITIES WOULD BE 200 000 EUROS. IT WAS ASSUMED THAT THE ALLOCATED HUMAN RESOURCES WOULD COST 6000 EURO PER YEAR.



Source: Auto elaboration based on the estimation of the estimation of the cost per year of issuing PIC/MAT to users of all GRS. According to DGRM, the amount needed to create a new platform with Bmar functionalities would be 20.000 euros. It was assumed that the allocated human resources would cost 6.000 euros per year.

7. CONCLUSION AND RECOMMENDATIONS

The main conclusions of this study are the following:

- There is deficient communication between the NCA and the national stakeholders that use the GRs, resulting in lack of awareness and misunderstanding from both R&D institutions and R&D companies about the NP that is resulting on lack of legal certainty of the present and future procedures related to the use of GR;
- Most stakeholders lack of awareness, capacity, knowledge and skills to negotiate MATs and deal with the complex terms of the bioprospecting contracts;
- The certificate of compliance with the NP can be a competitive advantage to some of stakeholders and work as proof of compliance with national law, good practices and evidence of sustainable and fair use of GRs. Not only to be used for marketing purposes but also to receive investment for R&D;
- The existing regulatory framework of Azores and Spain constitutes a good basis to work. It is possible to build upon the opinions of what is or not working with their process of granting PICs and MATs and also use the opinions of the creators of the BMar platform;
- Online platforms that issue dematerialized permits are an effective solution to solve the problem of lack of human resources and lack of efficiency of decentralized processes. Spain and Azores are struggling with process efficiency mostly because of high amount of paperwork and the dematerialization of processes could solve most of their problems;
- Portugal is in the frontline when it comes to development of state-of-the-art online platforms for administrative processes. Many benefits would come out of the use of an online platform to request and grant PIC/MAT for all National Territory;
- If the ABS regime is relatively welcoming and easy-to-use to applicants, then the incentive of stakeholders to bypass the system decreases;

- The implementation of the NP will be crucial to map the national GRs. The use of national GRs should also be mapped, not only to increase knowledge in GRs that are receiving more attention, but also to successfully manage the ones which stock may be compromised.

Based on the main conclusions, the recommended policy option is the following: Start with option 3 - Introduce the necessary modifications in the existing online platform BMar to regulate access and benefit sharing of marine GRs by national and international users– that will work as a pilot to test the design and effectiveness of the regulation. The CNA should commit resources to monitor the process during pilot tests so that it is possible to increase its efficiency and obtain real results, while paying attention and listening to potential users and their concerns. Only if the pilot is successful and the users are satisfied, the CNA should include the lessons learned from the pilot and chose option 4 - Regulate access and benefit sharing of all GRs by national and international users through a unique new online platform that works as a one-stop-shop to issue permits and inform about ABS procedures and best practices. The chosen platform should be available in Portuguese and English language, and it is recommended to include:

- a) One section to exercise Due Diligence, that may be linked with DECLARE;
- b) One section to collect information needed to issue the PIC, through a single form that the user fills out. The form will be multiple choice driven with a system of dichotomous key that automatically redirects to the relevant department of the national ABS Advisory Board to revise the request;
- c) One section for MATs, where it should be made available some examples on how to negotiate MAT benefits and best practices to comply with national legislation, clarifying the mandatory provisions and conditions that must be included within the MATs;
- d) One section containing databases with public basic information (Date, type of genetic resource and location) and the confidential information will only be available for administration or resource conservation purposes;
- e) A system of notifications of the requests and a section where the ICNF and other responsible departments can have access to the request, discuss the necessary steps and process the required documents;
- f) A personal section where the permits/agreements/certificates will be stored virtually for each user.

It is recommended to set up a team in ICNF to act on the decision of regulating access and benefit sharing of GRs. To do so, the chairman of the ICNF Directive Council should:

- I. Convene participatory process to understand the conditions and means needed to make a cost-efficient real-life based regulation process, taking this study into consideration;
- II. Convene the Advisory Board of the Nagoya Protocol, specialists and a systems analyst to discuss how to include the required functionalities into a platform;
- III. Once the regulation process is designed, translate the regulatory framework into law;
- IV. Employ the necessary Human Resources and design a training program for the ABS Advisory Board and the ICNF technicians to use the platform and process the required online documents (digital permits with QR codes) and give support to users;
- V. Develop codes of conduct for R&D Institutions and R&D Companies to comply with ABS that give clear and specific statutory requirements. Include the contact information for clarification of doubts or concerns;
- VI. Improve the ICNF website communication tools and contents, by maintaining the contents up to date and make use of cost-efficient communication tools to pass this information, like flowcharts and explanatory short videos that should be also present in the online platform.

This policy option will allow:

1. To solve the lack of communication problem between other regulating bodies and fosters trans-department knowledge and collaboration;
2. To help users and providers to know the necessary mechanisms for compliance and determine whether to share monetary or non-monetary benefits through MAT agreements, based on the guidelines provided in the platform;
3. Get easy access to digital PIC/MAT documents whenever is need;
4. Proof of origin of GRs and of fair and equitable practices;
5. Mapping of all requests nationwide, providing greater traceability and easy access to the map of national GRs;
6. To increase responsiveness and speed of the process, benefiting the users in particular;
7. To solve most of the Azores regulatory problems concerning the lack of financial resources to improve their regulatory online process.

This approach would give higher chance of efficient implementation since it takes into account the inputs of the potential users of the regulatory framework, while providing flexibility and space for improvement.

ACKNOWLEDGMENTS

This document resulted from the participation of its author in a training program of the Calouste Gulbenkian Foundation. LEAP – Policy Development Initiative is a capacity building programme about evidence-based public policy recommendations on sustainable production and consumption, designed for researchers and employees of non-profit organisations, universities and public administration.

The content and opinions expressed in this document are the sole responsibility of its author and do not necessarily reflect the policy or position of the Calouste Gulbenkian Foundation and its LEAP – Policy Development Initiative partners.

For more information about the project: <https://gulbenkian.pt/en/project/leap-policy-development-initiative/>

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Challenges in managing migratory species' fisheries: the role of stakeholders' engagement

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ABSTRACT

This study analyses the interactions among different stakeholders of migratory species' fisheries by having the adaptive management model from Mondego and Vouga River as examples of stakeholders' engagement and habitat recovery. The purpose of this analysis is to highlight the importance of effective engagement and participation of key stakeholders in the decision-making process to address sustainable issues. Fishers must be included when designing management measures to promote a better understanding of fishing rules. Thus, it is necessary a joint action and a strong collaboration of all parties to tackle unsustainable problems. The presented options to promote sustainable fishing are: 1 – to let government agencies continue to manage based on scientific advice provided by academia but with poor participation and engagement of the fishing community; 2 – to promote the establishment of stakeholders committees and the implementation of co-management plans; or 3 – to develop a new entity – Local Agent – to promote long-lasting impact through intervention to change unsustainable behaviours. Therefore, given the current immature level of fishers' engagement and participation in the decision-making process, required to be well represented in participatory groups, the recommended action is to develop an independent new entity to enhance fishers' accountability and increase sense of ownership towards the resources.

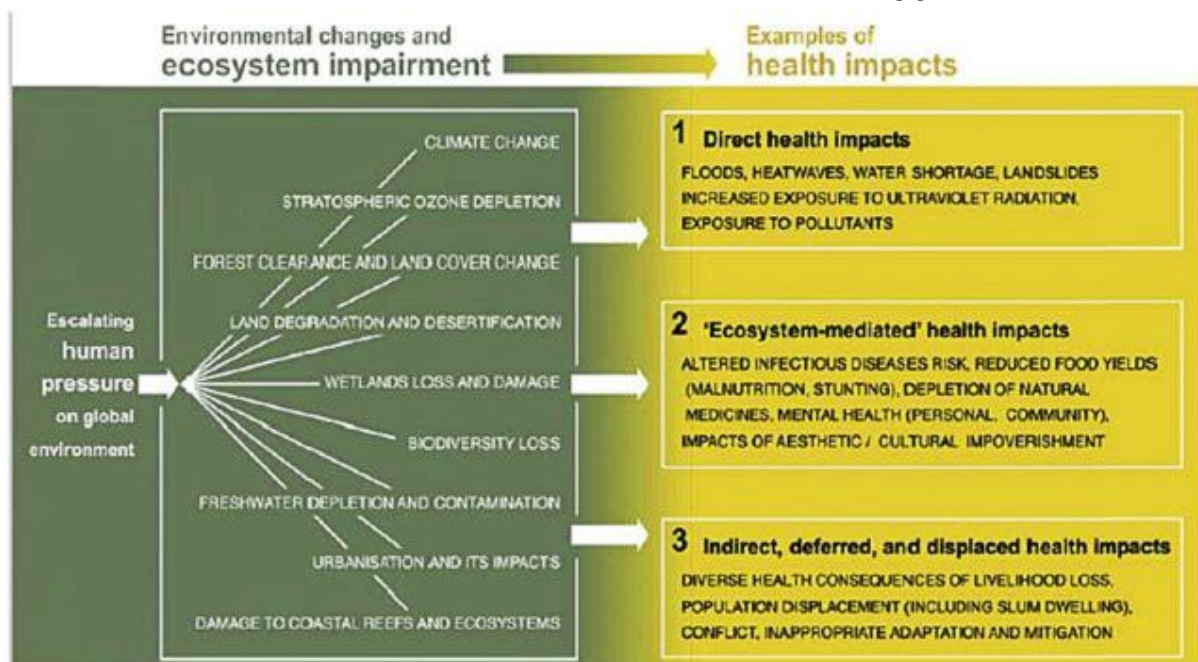
Keywords: Co-management, freshwater fisheries, community-based management, community empowerment, stakeholders' engagement.

JEL classification: Q, Q2, Q22.

1. HEALTHY WATER ECOSYSTEMS AND ITS' IMPACTS ON HUMAN HEALTH

Healthy water ecosystems are important for society since they provide goods and services, essential for human subsistence and well-being. More importantly, healthy ecosystems are vital to fight climate change and avoid the risk of infectious diseases. Additionally, a great proportion of world's population depends intimately on water ecosystems for survival and livelihood, and approximately 800 million people rely on fisheries and fishing products for living [1]. The pressure on aquatic ecosystems and on the resources they provide is increasing, such as threats introduced by land-use change; climate change; the invasion of non-native species; overfishing; and other anthropogenic activities which impacts biodiversity. Figure 1 offers an overview of anthropogenic impacts on environmental changes and as a consequence on human health [2].

FIGURE 1: IMPACTS OF ECOSYSTEM CHANGE ON HUMAN HEALTH [2]

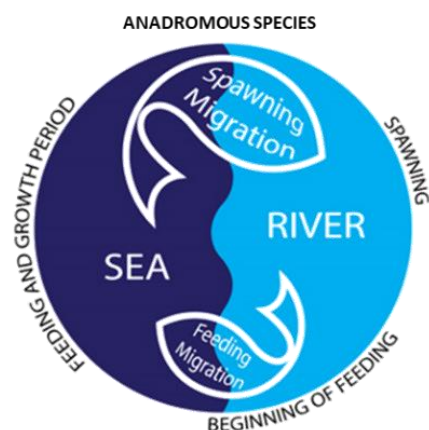


Source: Millennium Ecosystem Assessment (2005). Ecosystems and Human Well-Being: Health Synthesis. A Report of the Millennium Ecosystem Assessment.

<http://apps.who.int/iris/bitstream/handle/10665/43354/9241563095.pdf;jsessionid=5062152AFD7D8552453DA0A473786EF8?sequence=1> (accessed 26 January, 2020).

Anthropogenic activities on water ecosystems have great impact on migratory fishes, like anadromous (Figure 2), since these species rely on both marine and freshwater environments, stressing with a variety of pressures related to dam construction, water quality, habitat loss and overfishing [3,4].

FIGURE 2: LIFE CYCLE OF ANADROMOUS SPECIES



Source: <https://anadromos.pt/en/migratory-fish/> (accessed 26 January, 2020).

Mondego river basin presents a remarkable example of stakeholders engagement in the management of anadromous' fisheries. The first Portuguese inclusive management model was developed in this basin in 2013, promoted by University of Évora freshwater research team, with the scientific advice of Marine and Environmental Sciences Centre - MARE-UÉvora. Habitat recovery; data collection from fishing community; annual meetings with a set of stakeholders, such as

government agencies and fishers representatives, preceding anadromous' fishing season were some of the activities which were initially implemented (and are still ongoing) by this inclusive fishery management [3, 5, 6]. More recently, in 2017, this management model approach has been extended to the Vouga river basin, with stakeholders' engagement, and habitat recovery work [7]. However, anadromous' fisheries are failing in achieving the three pillars of sustainability: Environmental; Economic and Social. Habitat loss and overfishing factors have contributed greatly to this failure. Therefore, to manage these resources successfully, effective strategies and actions are needed, and stakeholders' effective engagement required.

The ongoing adaptive management at Mondego and Vouga basins are of considerable importance for anadromous' fisheries. Inclusive management initiatives are essential to support the engagement of all parties affected by a decision so that to increase the levels of compliance. This study advances the argument that, in dealing with anadromous' fisheries sustainability, decision-makers must recognize the importance of incorporating broader knowledge from the system, provided by different stakeholders, and promote effective participation and the establishment of management groups, due to the high level of unknown catches. Decision makers should ensure that the stakeholders affected by a decision have fair and equal access to the participation process and the opportunity to influence decisions so that all interests are factored in.

The study provides a discussion of the current situation of anadromous' fisheries management in Portugal, and a comparative analysis of Mondego and Vouga management model approach. It is based on a combination of interviews with different stakeholders (e.g., academia, government agencies, environmental NGOs, fishers, fishers representatives, municipalities and local markets), and research built in a human-centred design approach. This provided a deeper insight of the fishing community and the system, and helped to design engagement strategies for each, especially incentives to improve fishers' participation.

Furthermore, the research was conducted taking into account fishing communities from Mondego and Vouga rivers, where previous work has been done, by MARE-UÉvora team. However, the time spent working with the Mondego fishing community was far more than the time spent with the Vouga community, due to time constraints regarding Covid-19 pandemic and the sudden change of work dynamics, as Portugal declared emergency state and lockdown between 19th of March and 2nd of May, 2020. It would benefit the study to have spent more time with the Vouga fishing community as it would increase the insights allowing to identify further cultural and behavioural differences, and also a better engagement of the fishers in the research. The engagement work previously done with the Mondego community allowed to better conduct the research, especially after the 2020 lockdown, where it was possible to carry on close contact with fishers at a distance.

The issues covered in this policy study consist of:

- a) Threats to the anadromous population and fisheries sustainability, its causes and impacts at both the ecosystem and the community;
- b) The impact of external forces on anadromous' fisheries management: the water hyacinth invasion and Covid-19 pandemic cases.
- c) The role of stakeholders' engagement to effectively manage anadromous' resources so that to better address sustainable goals at all levels;
- d) The importance of empowering fishers to participate in the decision-making process and how it contributes to shift mind-sets in pursuing sustainable goals.

2. HABITAT LOSS AND OVERFISHING: ENVIRONMENTAL, ECONOMIC AND SOCIAL IMPACTS

The challenge of managing anadromous fisheries has to do with the fact that these species depend on both marine and freshwater environments, increasing the threats for survival as they move between ecosystems. In Portugal anadromous' resources have been regulated by technical and seasonal static fisheries measures, and a licensing point system limiting fishing effort [3, 5], regulated by the Portuguese Institute for Nature Conservation and Forests (ICNF) for freshwater fisheries and by the General Directorate- General for Marine Resources (DGRM) in coastal and marine waters. This was done without any coordination between them and without a formal stakeholder engagement, and without the implementation of an integrated nor management plan. Furthermore, there are differences between jurisdictions regarding fishing rules, catch assessments, and monitoring and

control, increasing the difficulties to manage the resource equally in both ecosystems [3, 5]. Additionally, from the fishers' point of view, those disparities arise inequity issues regarding fair access to the resources that could potentially lead to unsustainable practices [5]. Decision-makers must address simultaneously ecological and social issues, designing fair access rules for both jurisdictions, so that the interests from the community are equally encompassed.

Unsustainable practices from inland fisheries has been a problem for decades. According to a report from the Great Britain, Naval Intelligence Division, in 1942, referring to Portugal, "Inland waters are fished almost to exhaustion while in many marine districts farmers have one foot in the sea and on shore [8]." Revealing that unsustainable practices have been reported for over 80 years, and fishing in inland waters was an alternative activity together with agriculture, as it continues currently. Additionally, the construction of barriers in rivers over the years, and water pollution has affected anadromous populations adversely [3]. The combination of overfishing and habitat loss makes the management of these species a true challenge, requiring the involvement of all actors and different entities to efficiently tackle the various components contributing to the problem.

According to ICES, the conservation status of Allis shad in the Atlantic region is "unfavourable-bad" with declining populations [9]. Regarding the Sea lamprey and according to the same report [9], the species has disappeared from many European rivers. However, there are still some rivers with abundant catches and the importance of fisheries is high especially in Portugal [3, 6, 9], particularly at North of Tagus river, and France [9]. Despite both species are globally classified as Least Concern (LC) according to IUCN criteria [10, 11], they are listed in several international conventions as species requiring specific actions to guarantee favourable conservation status in Europe, namely the Convention on the Conservation of European Wildlife and the Convention for the Protection of the marine Environment of the North-East Atlantic, also known as the Bern and the OSPAR Conventions [4, 6]. Therefore, decision-makers must urgently promote the development of management plans, establishing effective measures to guarantee the protection of these species and to support data collection from fisheries, while recognizing the fishers' participation and engagement in the management process. Figure 3 highlights the main Portuguese basins where anadromous species, such as Allis shad and Sea lamprey have been commercially explored.

FIGURE 3: PORTUGUESE MAINLAND MAP HIGHLIGHTING THE MAIN BASINS WHERE ANADROMOUS FISHERIES OCCURS.



Source: <https://anadromos.pt/en/project/> (accessed 26 January, 2020) - esquema dos peixes anádromos.

2.1. Habitat loss, overfishing and unsustainable practices – Real threats for anadromous species

Interviews with stakeholders, conducted during the research period of this policy study, between January 2020 and June 2020, identified three main issues compromising anadromous conservation and hindering sustainable fisheries to occur. These were habitat loss, overfishing and unsustainable practices. Each one of these major problems have different components that should be tackled when

designing management plans. A detailed analysis for each of the identified problems is presented, providing a deeper understanding of its components.

2.1.1. Habitat loss – What if the fish don't have a home?

Water ecosystems have been dramatically changed with the growth in population and the subsequent increase of anthropogenic activities on the resources. Rivers are amongst the most altered and modified ecosystems [12] as a result of human activities such as longitudinal continuity interruption with the construction of dams and dykes, inert extraction, water pollution, amongst others [13]. These adversely affect biodiversity and more particularly, have great impact on anadromous populations, hindering access to spawning grounds. Furthermore, these infrastructures promote a decrease on population numbers of some species [14]. The Tagus River has been one of the worst national examples of habitat and biodiversity loss. In addition to irregular and reduced flows due to water retention in Spanish dams poorly regulated, Tagus also faces serious pollution problems due to the high pollutant discharges made by the nearby industry and agriculture. These impacts have been reported by riverside communities throughout the media^{111,112}, arousing public opinion attention, namely environmental movements and scientists, demanding for urgent measures and action to be taken. Also, fishing communities have reported what the scientific community has been observing, which is a general decrease in the number of Sea lamprey and Allis shad using Tagus River as a breeding site [13, 14]. Portuguese government needs to create channels for dialogue and synergies with Spain, to discuss ecological flows, while developing national mitigation and penalty policies to resolve pollutants' discharges into the river. Governments cannot reach environmental conservation goals alone, they need support from the public. Therefore, public participation and stakeholders' engagement are crucial to tackle environmental problems like these. This is reflected in the 2030 Agenda for Sustainable Development¹¹³, the need for fuller and more inclusive democratic participation is embedded in the Goal 16, which specifically calls for "responsive, inclusive and participatory, and representative decision-making at all levels" and also in the Aarhus Convention, to which Portugal is a party. Engaging the public in the decision-making process can address democracy deficits, such as distrust of political leaders, declining faith in public agencies, and low voter turnout [15]. It is thus necessary to guarantee that sustainability policies support the inclusion of all parties affected by a decision so that all interests are supported, particularly with regards to safeguarding the environment and preserving life and biodiversity.

I. Barriers construction

About 80% of the habitat that was estimated to be available in Iberian river basins for Sea lamprey is inaccessible due to barriers constructions [3, 4]. Dams, weirs and small hydroelectric plants (mini-hydro) construction, to energy production (hydroelectric), irrigation, flood control, water supply, recreational or navigation use [16] are the main interventions. The construction of these infrastructures is strongly driven by economic needs [12] as they support socioeconomic development [17]. In 2014, Portuguese water courses were regulated by 171 dams, more than 3000 small dykes and approximately 138 small hydroelectric plants (power less than or equal to 10 MW) [18], with perspectives to grow accordingly to human demand. More recent data (2020) for Douro River¹¹⁴ shows that in this basin alone there are over 1200 barriers. The environmental costs are high, changes in the river ecosystems must be considered in the decision-making process. Natural capital must be effectively accounted for by the decision makers, as well as enhancing public participation on environmental matters.

II. Inert extraction

Sea lamprey larvae live buried in rivers' sandy substrate, where they feed and grow, until they begin their migration to the sea. This kind of substrate is also explored for inert extraction due to

¹¹¹ https://www.rtp.pt/noticias/pais/poluicao-no-rio-tejo-o-que-ja-se-sabe_n1055778

¹¹² <https://www.sabado.pt/portugal/detalhe/como-espanha-envenena-a-agua-do-rio-tejo>

¹¹³ <https://sdgs.un.org/goals>

¹¹⁴ <https://dourovivo.pt/en/finalmente-eis-as-barreiras-e-as-barragens-do-douro/>

environmental conditions regarding low streamflow speed, and the deposit of fine materials at the river margins [4]. The removal or revolving of riverbeds used by lamprey larvae to grow in fluvial environment, can cause high mortality rates and contribute significantly to a progressive reduction of populations in Portuguese rivers [4,6]. Therefore, scientific advice and environmental assessment should be fundamentals at the decision-making process regarding resource exploitation. Participatory groups should be supported by government agencies to design better management strategies ensuring that all interests are encompassed, especially environmental interests and the conservation of biodiversity.

2.1.2. Overfishing – The problem of the unknown

Overfishing is a widely identified issue affecting fisheries all over the world. Among the reasons identified throughout the interviews, with different stakeholders, as contributing to this problem are bycatch and Illegal, Unreported and Unregulated fishing (IUU). The problem is the quantity of fish that is removed from ecosystem every year without being counted in for fishing mortality, either by illegal activities or by not being reported in official statistics. The issue increases in inland waters, where there is a lack of regulatory framework regarding landing obligation and therefore, no reporting scheme to collect data from catches. Additionally control and inspection are less effective at freshwater jurisdiction comparing to the maritime area. According to some of interviewed stakeholders, the amount of Allis shad and Sea lamprey that are not reported seems to be approximately 80% more than the national statistics. Furthermore, at community level those differences promotes injustice feelings enhancing disruptive behaviour. Government agencies responsible for regulating both jurisdictions must ensure equity when applying fishing rules and, regulate inland catches report are mandatory, while ensuring the monitoring and control of IUU fishing activities so that to increase the levels of compliance.

I. Bycatch

Allis shad is a common bycatch in coastal small-scale fisheries that use fixed nets to target sea bass and sea breams, in a percentage that can exceed the legal 30% allowed in the national jurisdiction. Paradoxically, some of the fishers that catch Allis shad at sea also target this species and lamprey in non-maritime waters [5]. The high amount of bycatch fills the market and dramatically lowers the price, despite the quality being lower than the allis shad fished in the rivers. Therefore, government must guarantee authorities' supervision and control actions are required to monitor Allis shad bycatch and initiatives to promote the differentiation, and appreciation, of shad caught in the river should be supported. This would create a disincentive to fish this species at the sea and reduce the levels of bycatch.

II. Illegal, Unreported and Unregulated fishing – IUU

The three components of IUU can be seen at anadromous' Portuguese fisheries:

Illegal fishing practiced by furtive fishers was identified by all interviewee as a key issue requiring urgent action. These illegal activities often occur in protected areas, where it is not allowed to fish, and supplies a parallel market and grey economy with great loss for the ecosystem, regarding the individuals not included in fishing mortality. In other words, fishing-induced mortality is underestimated, and scientific advice may be overestimating allowed catches; but also, regarding loss of earnings for both fishers and public system. Government must develop policies to suppress grey economy by establishing strict system of fines associated with tight inspection and control provided by local authorities in partnership with fishing communities, creating a disincentive to corruption whilst increasing levels of compliance among fishers.

Unreported and unregulated catches occur, especially at freshwaters due to the lack of a report scheme framework. There are fishers from this area that have businesses to fish and commercialize anadromous, those fishers pay their taxes and have catch data reports and commercial transactions. However, they do not have any obligation to report, which means that catches are not considered for official statistics nor for scientific advice, and thus are considered an Unreported catch due to the fact that is also Unregulated. The lack of regulatory framework to report freshwater catches can also stimulate the incentives to engage in grey economy as it often generates more income, fishers are then more motivated to participate in parallel activities to increase their profits and avoid tax

payment. Therefore government must enable policies to establish a report scheme for freshwater catches, and support initiatives to raise awareness among fishers to engage whilst promoting behavioural change and accountability towards the resources.

2.1.3. Unustainable practices – What are the drivers?

The drivers contributing for unsustainable practices can be group in four main reasons as follows:

I. Lack of and/or deficient membership

At transitional waters some fishers belong to fishing associations, others to Producer Organizations and others have no connection with any type of organization. In freshwater, no fisher belongs to any association. This weakens fishers' representation and participation in the decision-making process, which also could lead to disruptive behaviour and an excessive pressure in the resources [5]. Fishers' engagement and inclusion in the decision-making process are key to improve management and increase the levels of compliance.

II. Insufficient license requirements

Fishers in maritime jurisdictions have to land their catches at fishing docks, however a significant proportion of fishers only declare the amount necessary to get next year's licence. This seems to happen because fish sold in the parallel market often offers for more immediate earnings, and the low auction price coupled with tax and social security payments, seems to create a disincentive to engage in the regulated market. This will lead to the continuous decrease of the first sales price, and continuing the incentive to participate on the grey economy, and therefore the increasing of unknown pressure on the resources. It's a snowball problem that needs to be tackle within the community, creating incentives to engage in more sustainable practices, not only for species protection, but also to guarantee long-term revenues with more rational and responsible choices.

III. Competition from imports

Additionally, Portuguese Sea lamprey, competes with French Sea lamprey that arrives in the country driven by buyers filling national markets and lowering first sales prices. A few buyers and middlemen strongly control the market, often by supplying at low and uncompetitive prices. OSPAR stated recommendations, regarding management actions for the Iberian sea lamprey, urging contracting parties to guarantee reporting of commercial fishery data and accidental bycatch at sea, to establish a reporting scheme to gather all abundance data and to protect spawning grounds from fishing during the period from March to May [19]. It is thus necessary to guarantee measures to control and differentiate Portuguese Sea lamprey from the French. As suggested earlier, to add value for Allis shad from the river, initiatives to promote the differentiation and appreciation of Portuguese Sea lamprey could contribute to incentive buyers and consumers' preferences to more valued national products, enhancing local economy.

IV. Insufficient communication with stakeholders

The deficient communication amongst stakeholders was highlighted, during the interviews, as a hindering factor to the meaningful involvement of key stakeholders. The effective participation of stakeholders enhances communication, enables knowledge sharing and incorporate the interest from different parties [5]. France, for example, regulates migratory fisheries, where anadromous species are included, through the constitution of a consultative body – The Migratory Fish Management Committee (COGEPOMI)¹¹⁵ – engaging all the actors involved in the management of these species, including administration representatives and public institutions, fishers from both fresh and maritime waters, local communities, associations, hydroelectricity, amongst others. Therefore, various groups from different regions were constituted, regulated by the Ministerial Decree of 29 July in 2016 specifying the composition of COGEPOMI, in application of the article R. 436-49 from the French Environmental Code. The goal of COGEPOMI is the development of a five-

¹¹⁵ <http://www.bretagne.developpement-durable.gouv.fr/le-comite-a1840.html>

year plan for the management of migratory fish. This allows to tackle more efficiently community and ecosystem issues going forward to what is proposed by Common Fisheries Policy (CFP)¹¹⁶ regarding stakeholders' involvement and the United Nations 17th Sustainable Development Goal. Enabling regulatory framework to engage key stakeholders are mandatory. Portugal and France are both European countries where anadromous species, have high importance for fisheries and local communities [9], and they have both designated Sites of Community Interest (SCIs) based on these species [20], and thus the importance of managing these species, effectively promoting the involvement of different stakeholders and truthful knowledge sharing between all parties. Portuguese government must support the development of management committees to address the issue of the poor participation and recognition of fishers, as well as to improve system knowledge by broadening the access to the decision-making process.

2.2. Social and cultural backgrounds: What is hindering fishers' effective participation?

Fishers often reported difficulties to communicate their problems, struggle grows among those who don't have any kind of organization or neither belong to any association [5]. They often don't know to who or whom to address their problems and advocate for suitable policies. This leads to poor management results and persisting socioeconomic and ecological problems. Poor organizational level of fishers often hinders their participation in the decision-making process, as well as, to address and advocate for their interests. To address fishers' participation and engagement in the establishment of management groups, they have to be well and effectively represented, and therefore government should enable policies to guarantee fishers meaningful and active participation in the management consultation and decision. Furthermore, this lack of fishers' meaningful engagement, appears to be related with complex social and cultural background, hindering them to engage with the system [5, 21]. Fishers reported that there are unity and trust problems amongst them, regarding previous attempts to promote fishers' organisation that have failed due to some deviant and self-interest behaviour from some of the leaders. Despite all of the fishers thinking that an organization would be worthy for the fishing community and anadromous fisheries (100% of the 40 fishers interviewed, corresponding to 40 of a total of 100 licenses at Mondego, where not all of them are used), they also believe that it wouldn't work due to the lack of trust among them, in other people, and in the system in general, that is traditionally rooted. Additionally, issues regarding parallel market, taxes payments, conflicts with social security benefits, and simple disinterest were pointed as related with the unwillingness to participate or get involved in an organizational structure. Public policies must address social issues whilst simultaneously promoting sustainable use of natural resources.

Cultural issues and behaviours are hard to change in a short period of time, which seems to be related with low schooling levels, lack of communication skills within fishers and other stakeholders. This also can cause misinterpretations of information and disruptive behaviours promoted by unfairness feelings. However, it also seems that finding a common need could help to leverage fishers to organise, by brightening the understanding of the importance of being well represented to better advocate for their problems and needs. Engaging fishers in the decision-making process will contribute to increase their awareness and knowledge regarding the resource, and as a consequence their receptivity to and acceptance of management measures, whilst increasing their feeling of responsibility towards, and ownership of the resource [5, 21]. By working in partnership fishers acquire a wealth of knowledge and experience that can be used for tackling fishing problems [5]. These perceptions were also disclosed during the interviews with direct stakeholders' representatives, including government entities and academia, and more particularly with fishers, and fishers' representatives. A total of 54 stakeholders' representatives (46 fishers) from both Mondego (40) and Vouga (6) rivers, where interviewed.

2.3. Mondego and Vouga river Basin adaptive management model: A comparative analysis

A great investment in habitat rehabilitation for migratory fish has been made in the past decade at Mondego River, contemplating a six multi-specific fish passes' at Açude-Ponte in Coimbra. This 3 Million euros investment was promoted by the Portuguese Environment Agency (APA) in cooperation with MARE-UEvora. The construction of this infrastructure enables upstream and downstream migrations and allows for fisheries independent stock assessment by visual census, which complemented with juvenile estimation campaigns, improves the knowledge for scientific

¹¹⁶ https://ec.europa.eu/fisheries/cfp_en

advice. The abundance of Sea lamprey juveniles which upstream the fishing passage, increased 30 times, during the post-operational period (2012-2015). Partnerships have been established for the Vouga basin, namely with the paper industry, in order to optimize the uses of the river so that the interests of all users are compatible with each other and in compliance with the ecosystem [7]. Government and public agencies must develop policies that guarantees: the constructions made in Portuguese rivers do not block species migration along the river; environmental assessment provided by scientific advice; and whenever possible the collection of data for stock assessment.

In addition to habitat recovery works, since 2013 it has been developed an adaptive management model approach at the Mondego river basin, promoted by MARE-UÉvora team in line with the work regarding ecological assessment. This initiative promotes a greater monitoring of the fishing community in an attempt to obtain effective data from catches through the distribution of catch notebooks where fishers voluntarily report the quantities of lamprey and shad they catch, improving knowledge for scientific advice. More recently, in 2020, the same team developed an online app to encourage fishers to voluntarily report their catches anonymously, this app can be accessed through smartphones, computers or in two kiosks installed in two strategic points easily accessed by fishers [23]. At Vouga, catch data has also been collected through the involvement with fishers [7]. It should be noted that the level of fishers' engagement in both basins is different, fishers from Mondego collaborate much more in the data collection for scientific advice, due to the greater monitoring and longevity of the relationship between fishers and scientists. However, due to the larger effort to better accompany fishers from Vouga, a greater involvement of the community has been noticed, although very low when compared to Mondego, however disclosing that a closer monitoring and engagement enhances fishers' interest in participate. During the 2019 season an extra effort by MARE-UÉvora was made to promote a closer monitoring of Mondego and Vouga fishing communities, by trying to engage fishers to be more active and involved with the decision-making process [7, 23]. The results of these close monitoring were tackled during the interviews with the stakeholders throughout the study, and it seems to corroborate the importance to empower and engage fishers [5, 21]. At the Mondego river it was registered a higher level of fishers' participation at the annual meeting before the anadromous season, and the rules for 2020 season, for both jurisdictions, taking into account fishers' considerations and recommendations [5]. This represents an important step in creating the desirable engagement environment for the participatory process. However, there is a misrepresentation from freshwater fishers due to their lack of any kind of organization, even though it seems there was an increase in awareness, amongst fishers, for the necessity of being organised in order to be recognized and to have a transparent and effective voice, thus well represented at management group. Government agencies responsible for regulating both jurisdictions must ensure equality in applying fishing rules and develop regulatory framework to the establishment of report schemes for inland waters and improve fishers' engagement in the data collection and meaningful participation in the management processes.

2.4. The impact of external events on fisheries and the fishing community – The importance of fishers' recognition in the public participation process.

The lack of fishers' involvement and sense of unity weakens them when facing external problems that impacts their activities. Answering to social problems displays significant conceptual and control worries making it highly occasional and prone to setbacks [22]. During the development of the present work, fishing communities came across episodic and highly complex problems, impacting their activities that enhanced social and economic impacts, and to which they were not prepared or empowered to answer. Dealing with resources equity access for different users, government agencies and local authorities must guarantee that all parties affected by a decision have equal access to the public participation process, so that the community interest are encompassed.

2.4.1. Water hyacinth case – Mondego River

In January 2020, the invasion of an aquatic plant, water hyacinth, caused very serious damages in the beginning of the lamprey fishing season, raising dissatisfaction among fishers. The plant was caught by fishing nets and devices making fishing impossible (Figure 4), and as an invasive species needs a contention plan. Fishers didn't know what to do or how to act facing an external, yet impacting event. Thus, there was a need to promote a workshop, in order to design a strategy to promote fisher participation in the decision-making process.

FIGURE 4: INOPERABLE FISHING GEAR DUE TO WATER HYACINTH INVASION.



Source: Author.

There was a clear perception that this common “enemy” could be enable the engagement of fishers. The workshop was attended by a total of 31 persons, 28 fishers, a member of Docapesca (Docapesca – Portos e Lotas, SA is a state-owned company that provides the public service on mainland Portugal of organizing the first sale of fish and supports the fishing and fishing ports sector; one of the stakeholders identified in the stakeholders mapping process), a member of FORMAR (stakeholder identified during the stakeholders mapping process – Formar is a Professional Educational Fisheries and Sea Centre, where fishers obtain their maritime and professional certifications) and a member of MARE-UÉvora team (one of the stakeholders from the current management approach) (Figure 5).

FIGURE 5: WORKSHOP PROMOTED TO DISCUSS THE IMPACT OF WATER HYACINTH.



Source: Author.

The thematic workshop was particularly important considering that the fishing season had recently begun, the demand for lamprey was higher than the supply, and thus the prices were high and the devaluation is quick in time. During the workshop fishers express their worries and reported factual damages and impacts on their activities due to the plant. There was a discard of a great quantity of this plant to the Mondego River due to a decision from other river users and authorities, that didn't take into account other interests or activities, such as like fisheries. The loss of fishing opportunity caused by a decision of an indirect (secondary) stakeholder, regarding environmental problems, had great impact in fishers' revenues during the first two weeks of the anadromous season. According to fishers, each one lost in average 2 500€, considering 100 licenses the amount of lost revenues could easily reach to 250 000€ even knowing that not all licenses are in use. Additionally, this had a great impact in local economy, such as coffee shops and small markets that reported less income due to the reduction in fishing productivity (and revenues). Furthermore, the impact of this invasive species led to the general perception amongst fishers for the requirement of being more organised and also the need to be effectively included in the public participation processes that have direct impact in their activities, so that fishers' interests are counted in.

As an output from this workshop a press release was prepared and sent to the media to raise public awareness and propose measures to potential uses of the plant, also demanding for decision makers to include fishers in the public participation process to tackle water-hyacinth invasion. By including fishers' local knowledge, plans can be adapted quickly in reaction to changing environmental conditions, protecting both fishing community and the society that rely on fishers revenues.

As a consequence of the press release, Figueira da Foz Municipality stated that there is a contention plan under construction to remove the plant, where inputs from fishers can be included to prevent future problems. Furthermore, after the first Covid-19 lockdown had been lifted, a meeting was promoted with the mayor, three fishers and a MARE-UÉvora member, in July 2020. The impacts of water-hyacinth on anadromous fisheries income, and consequently on the surrounding community were briefly presented. Also, the work that has been carried out at Mondego river regarding anadromous management and fishers' engagement in the decision-making process were highlighted, and therefore the requirement to include fishing community into the discussion regarding water-hyacinth mitigation plan, since it directly affects fisheries and community welfare.

Recognizing the importance of anadromous fisheries for local economy, the mayor proposed a joint work to develop initiatives to promote Mondego river Allis shad and Sea lamprey, such as the participation in gastronomic events where show cooking and side events to promote Mondego fisheries and its products, could be organized. Also, fishers were invited to be part of a management group to develop mitigation actions for invasive species. Fishers' inclusion in this public participation process seems to have promoted a sense of ownership and an increased willingness to be involved in the river management and decision processes that affect the fisheries, which is contributing to increase the levels of compliance. Government should ensure that management strategies are in line with participatory spectrum of public participation: to promote information, consultation, involvement, collaboration and empowerment of the communities to better participate and address their issues, going forward to what Portugal has signed up to on numerous occasions, for example, as part of the Open Government Partnership¹¹⁷. Therefore, government agencies must recognize fishers' engagement in the decision-making processes and enable policies to empower fishers so that they can be able to independently advocate for their interests.

2.4.2. Covid-19 Pandemic

2020 and 2021 have been marked by the world pandemic caused by the new coronavirus SARS-Cov-2, which is causing a very serious and contagious respiratory disease, the Covid-19. The successive lockdowns is having enormous impact in the free movement of people and goods. Portugal declared Emergency State in March 19, 2020, which was extended until May 2, 2020 and was renewed from January 14th to May 3rd 2021, during this status people were unable to circulate outside their residential area, in order to prevent the virus to disseminate.

All of this unexpected series of events led to a sharp drop in fish exports to European countries, such as Spain and Italy, which is causing serious problems in economy. Covid-19 is having a massive impact for anadromous fishers. The demand for these species is highly connected with tradition and cultural events. Most of the buyers are restaurants and gastronomic festivals, where people gather during

¹¹⁷ <https://www.opengovpartnership.org/members/portugal/>

anadromous season to eat a variety of dishes made with these species. Facing the current pandemic scenario, the demand for Allis shad and lamprey have dropped drastically and almost disappeared. Fishers are mainly able to sell their catches to private consumers and at a very low price. This is causing great earning loss and is accentuating social differences. However, concerning Allis shad the demand also dropped dramatically, fishers were only able to sell to supermarkets and traditional markets at minimum prices. During the first two weeks of emergency state in 2020, Allis shad first sale in auction dropped to 0.04€ per kilo, during the same period it was for sale at the supermarket at 8€ per kilo, which reveals a great margin and the uneven distribution of the earnings, possible due to free market law, however the trading of this resource should be fairly regulated. The lower demand for anadromous, associated to low prices and the problems previously described, are causing feelings of injustice among fishers. This could compromise the efforts made so far to engage the fishing community, showing the urgent need to develop measures to ensure their involvement. In the January-April 2021 lockdown, a few restaurants were buying lamprey to cook and selling it in take-away mode, which improves the demand comparing to the previous lockdown.

At the begin of the Emergency state and during the anadromous season, fishers often tried to reach the stakeholder more involved with the community (MARE-UÉvora), in an attempt to understand what was happening, the impacts in their lives and to try to understand what to do. This is a positive sign and also show the importance of human-centred design approach in the engagement of fishers since it builds on the foundation of mutual trust relationships. It is also important to highlight that these extreme disruptive events could contribute to behaviour change regarding tax evasion with fishers realizing that help from Government is linked with their fiscal and social security payments.

When facing extreme and external events, it is evident that fishing communities need support in various ways, such as to advocate for inclusion in the decision-making processes, and more importantly effective communication and sharing of information. Therefore, it is mandatory to closely accompany the fishing communities to empower them to better participate and influence decisions that affect their activities.

3. POLICY OPTIONS: BUSINESS AS USUAL, FISHERIES CO-MANAGEMENT, OR COMMUNITY MOBILIZATION?

The following policy options present three strategies to tackle anadromous fisheries, and the advantages and disadvantages of each, based on the research findings of this policy study. The three options represent the current situation and explain why it is not achieving desirable goals; the ideal situation and why it is not currently easy to implement with success; and a transitional option to engage fishing community and promote changes in behaviour.

3.1. Policy Option 1— Current Situation

To let government agencies to continue to manage anadromous fisheries based on scientific advice provided by academia with poor participation and engagement of the fishing community.

The management model approach developed at Mondego and Vouga, includes annual meetings before the anadromous' season, an effort to engage fishers in the decision-making process whilst assuring the ecological assessment status of anadromous [7, 23]. This adaptive management approach, as describe earlier in this article, has shown positive results, especially regarding habitat recovery and fishers' willingness to participate in the processes. There is a general recognition among fishers, and other stakeholders, that the work that has been promoted by the academia at Mondego, has contributed for the increasing anadromous population, particularly for Allis shad.

Therefore, the entities identified earlier, and fishers' representatives could represent a primary stakeholders group with direct action in fisheries. However, local authorities are not formally involved and the high level of IUUs occurrences reported by licensed fishers still occurs. Approximately one million euros have circulated in the grey economy in 2019 at Mondego basin, according to the information disclosed during the research. This total value accounts for the fish sale in parallel markets by fishers to avoid taxes but also due to the high level of furtive fishing, which often supplies commercial circuits at lower and uncompetitive prices, increasing the incentives for fishers to participate in the grey economy to improve profits. Civil society, usually represented by

NGOs, are not present at these meetings and is an important stakeholder element to assure that the public interests are counted for when managing resources.

Furthermore, and similar to the French example of COPEMI, there is another set of stakeholders, a secondary group, needed to be considered regarding their water use activities and the indirect connection with fishing activities, namely the Electricity of Portugal (EDP), the Portuguese Environmental Agency (APA), Municipalities and other river users, such as agriculture and sports. It should be assured that water users are in compliance. However, after the approach with Figueira da Foz Municipality regarding the water-hyacinths invasion, the mayor was present at the annual meeting in November 2020 for the first time. This provoked in the fishers a sense of consideration and inclusion of their issues and worries, enhancing the willingness to participate, reinforced by the communication channel established to report any occurrence.

Also regarding 2020 annual meeting from Mondego, which occurred on line, representing a step forward to communication flow, and considering the current pandemic situation, it was decided to hold an extraordinary meeting in February 2021 to prepare a situation report and decide the following fishing rules. Furthermore, at this meeting it was discussed fishing and market opportunities, considering the lockdown situation and the fact that restaurants were working on a takeaway basis. Due to the unpredictability of the pandemic situation and how much longer it will take, it was decided to hold another extraordinary meeting immediately before the biological closure to evaluate the situation and decide on the fishing rules to apply. These extraordinary meetings have contributed to improving trust relationships between all parties and to increase fishers' accountability and sense of ownership towards the resources. However, despite the increasing willingness to participate there is an important part of fishers that do not participate or engage in the decision-making process, either due the lack of organisation and representation, or due to the unwillingness to organise, and the distrust in the system, revealing the importance of close accompany and empowerment work within fishing community.

Findings from the interviews with fishers, corroborated by literature [5, 21, 22], reveals that a better stakeholder engagement and fishers empowerment could help deal more effectively with other complex problems that impacts fisheries and fishing value, such as Allis shad bycatch and Sea lamprey traceability; buyers' and IUUs' control; damages caused by external activities in fishing areas; and dealing with other water users stakeholders, revealing the necessity of a full-time commitment work to effectively engage fishers improving the quality of their participation.

Furthermore, anadromous species are only caught during three months per year, and the choices fishers make in other fisheries during the rest of year will impact their behaviour during anadromous' season, revealing the importance of ensuring their continuous engagement, empowerment and availability to work on other issues. In this management approach, the level of participation in annual meetings is considerable high, around 40 fishermen per meeting at Mondego. However, the quality and equity of participation are not safeguarded, and fishers with a local association overpower fishers from inland waters with no representation. In order to promote management compliance from all fishers, the entire community must be well represented, so that government may establish measures and strategies to empower and engage fishing community.

3.2. Policy Option 2 – The desirable situation – Co-management

To promote the establishment of stakeholders committees and the implementation of co-management plans.

Co-management has been seen as a tool in achieving sustainability goals and a solving process, since it incorporates a set of stakeholders all linked with the fishing sector, ensuring exchange of knowledge between all actors, and involves negotiation, deliberation, knowledge generation and joint learning [24]. This promotes well-informed decisions at designing adaptive management plans, rather than static arrangement [25]. Co-management can be defined by a set of agreements with different degrees of power sharing, allowing for the joint decision making of the government and the users over a group of resources or areas [26]. Stakeholders' participation and empowerment are some of the principles and guiding ideas included in co-management. Collaboration and shared responsibility between resources users and managers promotes flexible and context-specific strategies, based in a deeper knowledge of the system provided by the different stakeholders [5].

There is a need to constitute co-management groups regarding migratory species, since the wide range of its distribution, between the sea and the river, may hinder that these species achieve a sustainable management. Regulating co-management groups could represent a tool to prevent the impact of upstream and downstream events that are not fisheries-related but that can induce damage in fishing activities, e.g. hydropeaking, removal of woody and vegetable debris from the banks and channels to the main river course, amongst others.

Currently, there are two known co-management project in Portugal, aiming the constitution of a co-management group to implement co-management plans and better address sustainability goals. Co-Pesca2 aims to implement a co-management committee for the harvesting activity of stalked barnacle in the Berlengas Marine Protected Area, classified by UNESCO as a Biosphere Reserve [27]. Participesca, is still in an early stage and will focus on the southern (Algarvian) small-scale fisheries. Co-Pesca 2 project already has an established committee and is currently working on the development of proposal to officially establish the committee according to the recent Decree Law 73/2020, 23th of September. However, despite this fleet segment is consisted of only 40 fishers, not all of them are represented, due to difficulties to organise which often hinders effective communication of what is discussed in the committee, leading to misinterpretation and conflict of interest. Furthermore, there is a general perception among barnacle fishers that the constitution of the committee group supported the engagement of fishers enhancing their willingness to participate, and more importantly has been contributing to the increased sense of ownership and responsibility towards the resources. This example shows the importance of working on the fishers' empowerment and to promote their organization so that better address the co-management committees' goals.

Enabling co-management regulation is essential to promote a holistic view of the system where fishing activities occur, and could be crucial to identify and prevent negative impacts. Co-management of anadromous fisheries could represent a problem-solving tool to better address those problems, promoting flexibility in measures and a comprehensive knowledge of the system if fishing communities were well and effectively represented so that could better participate in management process. However, according to number 1 of the 15^o article of the new general fisheries law, regarding the constitution of co-manage groups, at least 51% of the allocated licenses must be in accordance with the creation of the committee. Furthermore, as previously describe in the Problem Description chapter, the level of fishers organisation are far behind what it should be in order to create a co-manage group, especially regarding freshwater fishers with any kind of organisation, and also there are cultural and social issues needed to be tackle in order to promote fishers empowerment and capability to organise and understand co-management rules and goals. Therefore, there is a necessity to develop a pre-co-management solution to engage and empower fishers so that co-management committees could be successfully implemented.

3.3. Policy Option 3 – The needed situation – Local Agent Approach

To develop a new entity - local agent - to promote long-lasting impact through intervention to change behaviours.

This option proposes the creation of a new entity, independent from government, administration and university, preferably with no interests at those levels, using a human-centred design approach. By developing a close work (relationship) within the fishing community, to engage and empower fishers for an effective participation in the management process. This approach can be seen as a transitional option between the current management approach, carrying out at Mondego and Vouga, and the desirable option, the establishment of co-management groups. Additionally, these two communities could be the basis to implement this new approach, given the work that has been done in each, and would especially be beneficial for the Vouga community, considering the works recently begun by MARE-UÉvora team.

Behaviour is the most difficult and time-consuming variable to change, but is an essential key needed to pursue sustainable fisheries. Developing a new entity to work close with fishers and fishing community will contribute to promote a better understanding of their needs and to disclose incentives to promote more sustainable choices and resource awareness. This approach promotes a trust environment for fishers, especially from freshwaters fishers to get more involved and willing to organise and participate in the decision-making process, which could be the first step towards future implementation of co-management plans for anadromous species. This also contributes to achieving

the United Nations Sustainable Development Goal, especially the 16.7 target by ensuring responsive, inclusive, participatory and representative decision-making at all levels.

Local communities' empowerment has been seen as a way to involve people in the decision-making process and there is a wide range of projects all over the world with different ecosystems and resources using it to achieve sustainable goals [28, 29, 30, 31, 32, 33]. Allows to bring together co-management and complex systems thinking to design management plans ecosystem and community-based, whilst promoting community education at social, economic and financial levels, though the constitution of bridges and synergies between different education entities in order to adjust what are the community needs and the education offered, thus promoting effective long-lasting change by giving fishers tools and knowledge to make more sustainable choices at all levels.

The research conducted during this study reveals that there is a need of a local entity – Local Agent - to link all the stakeholders and act like a bridge facilitating the communication between the different parties whilst working within the community engaging and empowering them. Water hyacinth case is a remarkable example of fishers' engagement and participation, even though it's not directly related to anadromous primary group of stakeholders, it impacts fisheries and community as well, and fishers' inclusion in the public participation process took place in a remarkably fast time, even more considering Covid-19 constraints, so the urgency of the subject. Due to the inclusion of fishers' interests in this process, the situation changed in 2021 and the municipalities took responsibilities to not let the plant invade Mondego during anadromous fishing season, promoting an increase of willingness to continue participating in the decision-making processes.

Given to immature level of fishers' engagement Local Agent will contribute to achieve sustainability in the anadromous fisheries by helping fishers to make more responsible and rational decisions, promoting their meaningful involvement with other stakeholder whilst it enhances feelings of ownership and social justice. Additionally, the benefits of this local entity work could extend to other species targeted by most of the same fishers, namely sea bass and cockle.

A better organisation of fishers will contribute to: value their catches and differentiate it from allis shad bycatch and French lamprey; strengthen and empower them to advocate for fairer transaction prices with buyers and middlemen, and also the first sale price at auction; improve data collection from catches enhancing knowledge for scientific advice and management; and to improve fishers participation in adaptive management plans and strategies. Simply fishing less, by itself, is not the only answer for sustainable fisheries, since sustainability must be attained at all outcomes. Commercial fishers must be part of the sustainable fishing plan and, to do so, they have to be organized and think as a group of players with fishing management strategies.

This article suggest the establishment of a local entity - Local Agent - as a way to achieve long-term sustainability for anadromous' fisheries, and as a transitional step to implement co-management committees, through working on:

- Empowering fishing community while improve the level and quality of participation in the decision-making process;
- Providing stakeholders with information needed to participate in a meaningful way and include inputs from fishing community in designing how they participate in the various issues regarding their activity;
- Improving communication and promoting efficiency and transparency in shared information amongst all parties at all levels, including more reliable data for scientific advices;
- Improving fishers' organisation and association to be effectively, independently and well represented in future co-management committees;
- Promoting the desirable and trustful environment to establish co-management committees effectively;
- Promote long-lasting change behaviour by supporting the improvement of fishing community education.

4. CONCLUSIONS AND RECOMMENDATIONS

Mondego and Vouga rivers adaptive managing approach are a good example of the importance of inclusive management initiatives for sustainable development of anadromous' fisheries, particularly

in what concerns the involvement of crucial stakeholders for habitat recovery. Also, due to the effort made to closely accompany the engagement fishing communities in data collection, and in the decision-making process, more successfully in Mondego where a longer relationship between the research team from MARE-UÉvora and fishers exists. This research supports the need to develop more inclusive policies. Despite those efforts, unsustainable practices and disruptive behaviours still occur at both basins mostly due to the lack of a proper engagement of key stakeholders. Fishers also lack in skills to organise and to effectively participate in the decision-making process and to accurately advocate for their interests, not only at anadromous' fisheries but also for other problems which may impact (indirectly or directly) their fishing activities, and where they should participate and be properly represented. However, there are signs indicating that the involvement of fishers in the adoption of more sustainable practices is possible, but requires a full-time commitment in building a mutual and trustful relationship to assure those behaviours are consistent and permanent in time, and therefore guarantee long-last changes.

Fisheries management should not be based solely on scientific advice to efficiently achieve sustainable goals. Well managed fisheries respect human and labour rights, ensuring fair salaries, health and well-being, guarantee fair fishing agreements and the involvement of fishing communities in management decisions. Therefore, it is urgent to enable conditions that guarantee that information is effectively and equitably shared among the various users of the system, assuring that all parties have equal access to participate in the decisions though the establish of participatory management groups. To establish a participatory management group, like co-management committees, it is necessary to guarantee fishers effective representation and participation, and therefore the need to develop measures to engage and empower communities. Community engagement and empowerment should not solely rely on projects involving fishers, but rather on a full time commitment to improve their ability to communicate and also increases them recognition as part of the management process, therefore it's urgent to develop measures to recognize that commitment.

It is important to highlight that social and cultural backgrounds greatly influence the choices that fishers make. Also, low schooling levels contribute to perpetuate disruptive behaviours, a considerable part of the fishers don't acknowledge the difference between finances and management (business management and natural resources management) which hinder their ability to critical analyse when going fishing does not compensate and it is more likely to have more expenses than the income from catches. These findings reveal that it is crucial to invest in fishers' education at some point to ensure that today's illiteracy issues are solved in the future. Fishers' professional education must address real community needs in order to induce change.

Finally, the findings of this study point out that fishers who feel that their concerns and interests are considered in the management of the resources tend to change their attitudes and get more involved with the system and the ecosystem, and thus enhances the sense of ownership and accountability towards the resources. For those reasons, developing a local entity – Local Agent – to engage and empower fishers, will promote more sustainable fisheries of anadromous species by covering the following recommendations:

- Facilitate and promote the bridge between fishers, scientists, administration, local authorities, and other relevant stakeholders, with direct and/or indirect involvement in the management of anadromous fisheries;
- Reinforce fishers engagement for other species targeted by the same fishing boats, and other issues related to fisheries;
- Promote stakeholders' knowledge by providing a more holistic view of the various components of the system, and ensure that all information are shared equitably and accurately based on transparency;
- Support better data collection for scientific advice;
- Support research for solutions more community and ecosystem-based;
- Support more sustainable choices by the decision-makers, at various levels, based on all participants' interests and needs;
- Support ecosystem conservation by engaging the community to commit in making more sustainable choices by promoting education at all levels;
- Support fishers' cohesion and empowerment;

- Enhance fishers' accountability and sense of ownership towards the resources and promote long-lasting change with more sustainable behaviours.

In conclusion, and having in mind Balmford words "Conservation is not primarily about biology but about people and the choices they make." [34]. Promoting education bases to pursue future well informed fishers, and empower presently active fishing communities are crucial to effectively produce change and achieve sustainability in the future. Through the development of a local entity – Local Agent – government would promote a meaningful engagement with fishing communities, more equity and efficiency in fishers' participation, whilst enhancing the levels of compliance moving towards to what are the government priorities regarding the constitution of co-management committees. Nevertheless, promoting long-lasting change to pursuing sustainable anadromous' fisheries, answers to what is proposed by the CFP and the Sustainable Development Goals, namely SDG 14, 16 and 17, regarding resources conservation, public participation processes and the involvement of different stakeholders.

ACKNOWLEDGMENTS

This policy study was produced in the context of the research conducted under LEAP – Policy Development Initiative, a program developed by the Calouste Gulbenkian Foundation in collaboration with the International Centre for Policy Advocacy (ICPA) and IES – Social Business School. The opinions expressed in this study are those of the author. They do not to purport to reflect the opinions or views of the CGF, ICPA and IES or its member.

Thankful words should be given to all of those who contributed to this research giving interviews, sharing their insights and knowledge, particularly to fishers from Mondego and Vouga rivers for the sharing thoughts, worries and outbursts which greatly add to this work.

Gratitude words for LEAP mentors, Lisa Borges and Eíón Young for the knowledge, guidance and wise advices. Final thanks to Yorgos Stratoudakis, Rita Sá and Tereza Fonseca for the inspiring discussions and the most exquisite thoughts.

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Produzir alimentos biológicos e locais para abastecer as cantinas escolares: opções políticas de acesso à terra

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ABSTRACT

Individual and institutional demand for organic food in Portugal is swiftly increasing. This demand is an opportunity currently missed due to farmers' lack of access to land. At this point, we claim that land availability needs to be centrally taken into consideration in the formulation of local and national food policies.

In particular, we suggest: 1) coherent cross-sectoral policy options, notably regarding land needed to achieve sectoral goals; 2) mechanisms to strengthen multi-level and cross-sectoral food governance, with a focus on access to land for organic food production, in particular vegetables and fruit.

Based on the municipality of Torres Vedras as a pilot case, we conclude that local policies require a bundle of instruments which will vary from place to place. Nevertheless, local authorities have a key-role to play as facilitators of access to land, primarily by identifying and mapping idle land either communal, public, or private. That land should be made available to organizations and farmers willing to supply primarily local schools, and in a second phase to local consumers. Results from field visits and interviews to local stakeholders in Torres Vedras suggest that cooperation across city departments and local stakeholders could spearhead an integrated food policy that would turn idle land into the decisive element of a blooming local food system.

In conclusion, any municipality can do it, if there is political willingness to develop a collaborative process within municipalities aiming at thinking strategically how to access land for local organic food production.

Keywords: Local authorities, land, food policies, organic food, school canteens.

JEL classification: Q15, Q18, Q58.

RESUMO

A procura individual e institucional de alimentos biológicos está a aumentar em Portugal. Esta procura é uma oportunidade perdida devido à falta de acesso à terra por parte dos agricultores. Argumentamos que a disponibilidade de terra deve ser tomada em consideração na formulação de políticas alimentares locais e nacionais.

Em particular queremos sugerir a existência de: 1) opções políticas intersectoriais coerentes, nomeadamente no que respeita ao acesso à terra necessária para alcançar os objetivos sectoriais definidos; 2) mecanismos para reforçar a governação multinível e políticas intersectoriais com ênfase no acesso à terra para a produção de alimentos biológicos, em particular produtos hortícolas e frutícolas.

Tomando o município de Torres Vedras como caso piloto, concluímos que as políticas de acesso à terra, requerem um pacote de instrumentos que variam de lugar para lugar. No entanto, as autoridades locais têm um papel fundamental a desempenhar como facilitadores do acesso à terra, principalmente através da identificação e do mapeamento de terrenos devolutos, sejam eles comunais, públicos ou privados. Essas terras devem ser disponibilizadas às organizações e aos agricultores dispostos a abastecer prioritariamente as escolas locais e, numa segunda fase, os consumidores locais. Os resultados das visitas de campo e das entrevistas aos atores locais em Torres Vedras sugerem que a cooperação entre os departamentos municipais e entre estes e os atores locais poderá alavancar uma política alimentar integrada que transforme a terra no elemento decisivo do sistema alimentar local.

Em conclusão, qualquer município pode fazê-lo se houver vontade política para desenvolver um processo colaborativo e pensar estrategicamente o acesso à terra para produção de alimentos locais, e biológicos.

Palavras-chave: Autarquias locais, terra, políticas alimentares, alimentos biológicos, cantinas escolares.

Classificação JEL: Q15, Q18, Q58.

1. INSUFICIENTE PRODUÇÃO LOCAL BIOLÓGICA PARA FORNECER AS CANTINAS ESCOLARES

A produção de alimentos biológicos em Portugal é insuficiente em face da procura crescente dos consumidores e instituições, nomeadamente das autarquias locais que pretendem incluir alimentos biológicos¹¹⁸ produzidos localmente¹¹⁹ nas refeições das cantinas escolares.

O diagnóstico elaborado no âmbito da Estratégia Nacional para a Agricultura Biológica (ENAB) e respetivo Plano de Ação (PA) (Resolução do Conselho de Ministros n.º 110/2017)¹²⁰ corrobora o problema, i.e., 49% dos frutos e produtos hortícolas consumidos em Portugal e 43% dos cereais e leguminosas são importados (dados referentes aos anos de 2014 a 2016). Durante este período, onze países forneceram 480.725 kg de produtos biológicos para satisfazer as necessidades de consumo no território nacional, destacando-se como fornecedores a China (208.066 kg) e o Equador (157.380 kg).

Argumentamos que a produção local é limitada devido à ausência de uma abordagem multisectorial e multiatores capaz de alinhar a procura (consumo) com a oferta (produção), nomeadamente estabelecendo mecanismos de acesso à terra de forma a assegurar a produção de alimentos biológicos de origem local.

Na secção seguinte explicaremos as razões que justificam este desalinhamento.

2. POR QUE É DIFÍCIL ACEDER À TERRA PARA PRODUÇÃO AGRÍCOLA?

2.1. As políticas existentes são omissas em relação aos instrumentos de acesso à terra

De acordo com a ENAB e respetivo PA, o peso da Agricultura Biológica em relação à Superfície Agrícola Útil (SAU) nacional (2009) representa 6,6%¹²¹ do território continental e regiões autónomas, o que corresponde a 240 mil hectares. No entanto, quase 70% dessa área é ocupada por pastagens para gado. A percentagem da SAU nacional em produção Biológica ocupada por produção hortícola é de 0,6% e a área em produção frutícola de 1,5%. Um conjunto de políticas públicas recentes, nomeadamente a ENAB e respetivo PA (2017), a revisão do Programa Nacional da Política do Ordenamento do Território (2019)¹²² e o Roteiro para a Neutralidade Carbónica 2050 (2019)¹²³,

¹¹⁸ No fornecimento de produtos biológicos às cantinas escolares consideramos apenas os hortícolas e frutícolas. Para efeitos da presente proposta de política pública não serão consideradas as proteínas animais.

¹¹⁹ Para limitar a complexidade da discussão em torno do conceito de local optou-se por considerar os limites administrativos do município.

¹²⁰ Resolução do Conselho de Ministros n.º 110/2017, publicada no Diário da República n.º 144/2017, Série I de 2017-07-27. Estratégia Nacional para a Agricultura Biológica e o Plano de Ação para a produção e promoção de produtos agrícolas e géneros alimentícios biológicos. Link: <https://dre.pt/web/guest/pesquisa/-/search/107761909/details/normal?q=Estrat%C3%A9gia+Nacional+para+a+Agricultura+Biol%C3%B3gica+> (acedido em maio 2021).

¹²¹ De acordo com a publicação do Eurostat de 2021, a percentagem estimada (não existem dados) de SAU em PB em Portugal é de 8,5%.

¹²² Lei 99/2019 publicada no Diário da República n.º 170/2019, Série I de 2019-09-05. Primeira revisão do Programa Nacional da Política do Ordenamento do Território. Link: <https://dre.pt/pesquisa/-/search/124457181/details/maximized> (acedido em maio 2021).

preveem o aumento da SAU em produção biológica. A lei respeitante aos critérios de seleção e aquisição de produtos alimentares nas cantinas escolares públicas (Lei n. 34/2019, de 22 de maio, artigo 5), incentiva o consumo de produtos locais, alegando menores custos logísticos e de distribuição e menor impacto no ambiente devido à redução da distância de transporte.

A ENAB e PA (2017) propõe que até 2027 "a área de terra agrícola em produção biológica corresponda a 12% da terra agrícola nacional¹²⁴, o que representa um aumento de aproximadamente 150 mil hectares de terra em produção biológica¹²⁵, e que a área correspondente à produção de hortofrutícolas, leguminosas, frutos secos, cereais e outras culturas hortícolas destinadas ao consumo direto ou transformação triplice até 2027"¹²⁶.

Resumindo, existe um conjunto de leis inovadoras e bem-intencionadas cuja ambição é aumentar a percentagem de SAU em produção biológica. No entanto, não existe qualquer referência ao modelo de execução, no terreno, deste desiderato.

2.2. Faltam ligações entre o ordenamento do território, o acesso à terra e o abastecimento alimentar

O tema da alimentação, da produção ao consumo, tem sido negligenciado pelos urbanistas, que consideram os terrenos agrícolas como potenciais áreas construtivas, e os agrónomos, que balizam a sua intervenção aos espaços rurais (Lohrberg, 2016). Esta ausência de debate intersectorial foi assinalada por Pothukuchi & Kaufman (2000) e mantém-se atual. De acordo com Cabannes & Marocchino (2018), a integração da alimentação no planeamento urbano é um tema emergente.

Alguns autores, como Perrin & Nougaredes (2020) ou Tornaghi (2017), têm discutido o acesso à terra para a produção agrícola sob a ótica da justiça social. Outros, como Petrescu-Mag et al (2019), trabalham a perspetiva do acesso e da segurança. Ainda que menos presente na literatura, alguns autores como Manganelli & Moulaert (2019) e Wubben & Isakhanyan (2011) abordam o papel das autoridades locais no acesso à terra pública.

Sonnino (2009), Wahlen et al. (2012) ou Palacios - Arguello et al. (2018) analisaram o abastecimento às cantinas escolares e restauração pública. O ponto de entrada tem sido a aquisição de alimentos saudáveis, atendendo ao seu valor nutricional. Resumindo, a necessidade de conectar a produção local com as exigências de fornecimento das cantinas escolares ainda não está explorada, devido, argumentamos, à ausência de uma problematização territorial.

2.3. Faltam ligações entre as iniciativas existentes e uma visão estratégica da alimentação

A Resolução do Conselho de Ministros n.º 103/2018, de 26 de julho, que estabelece o Conselho Nacional de Segurança Alimentar e Nutricional¹²⁷ reconhece a necessidade de uma melhor e maior integração dos atores e sectores alimentares, mas os efeitos práticos deste reconhecimento são, até à data, inexistentes. Em paralelo, há movimentos da sociedade civil que procuram construir ligações entre os atores do sistema alimentar, e.g. a plataforma nacional Alimentar Cidades Sustentáveis criada em 2018¹²⁸, um coletivo de atores implicados de forma voluntária no propósito de tornar o sistema alimentar em Portugal mais sustentável através da partilha de conhecimento fundamentado e plural. Esta plataforma reúne atualmente mais de 350 membros. Aos níveis nacional e local, várias

¹²³ Resolução do Conselho de Ministros n.º 107/2019 publicada no Diário da República n.º 123/2019, Série I de 2019-07-01. Roteiro para a Neutralidade Carbónica 2050. Link: <https://dre.pt/web/guest/pesquisa/-/search/122777644/details/normal?q=Roteiro+para+a+Neutralidade+Carb%C3%B3nica+2050>. (acedido em Maio 2021).

¹²⁴ Este valor está abaixo do estabelecido na *Estratégia do Prado ao Prado* (Comissão Europeia, 2020), que prevê que até 2030 25% da área agrícola esteja em modo de produção biológica.

¹²⁵ De acordo com o Censo Agroalimentar (2009), existiam 127 mil hectares de terra agrícola não cultivada. Esta área está aquém dos 150 mil hectares mencionados para que exista 12% de SAU em PB em Portugal.

¹²⁶ De acordo com os dados disponíveis na ENAB, as áreas em PB (2015) para cada cultura são as seguintes: hortofrutícolas (0,6%), frutos secos (3,7%), e outras culturas hortícolas – dados conhecidos para o olival (9,0%); culturas arvenses (inclui leguminosas, cereais, oleaginosas e proteaginosas) – (3,2%), fruticultura (1,5%) e plantas aromáticas (0,5%) – total de 18,5% da área em PB, ou seja, presume-se que se pretende que estas culturas representem 55,5% da área em PB. Ver frase. Não se percebe o uso dos travessões.

¹²⁷ Resolução do Conselho de Ministros n.º 103/2018 publicada no Diário da República n.º 143/2018, Série I de 2018-07-26. Link <https://dre.pt/web/guest/pesquisa/-/search/115777792/details/normal?q=Resolu%C3%A7%C3%A3o+do+Conselho+de+Ministros+n.%C2%BA%20103%2F2018> (acedido em Maio 2021).

¹²⁸ Para mais informação sobre a plataforma Alimentar Cidades Sustentáveis ver shorturl.at/eDMXZ.

organizações estão a liderar iniciativas alimentares isoladas, algumas delas lutando para encontrar terra (Delgado, 2015). Estas iniciativas representam uma enorme janela de oportunidade para a elaboração de políticas alimentares multiatores e multissetoriais atualmente inexplorada pela falta de uma visão estratégica territorial da alimentação.

Por fim, o e-book Alimentar boas práticas: da produção ao consumo sustentável 2020 (Delgado, 2020a) ilustra a diversidade dos atores envolvidos nos sistemas alimentares em Portugal, a sua escala territorial e os múltiplos espaços onde ocorrem; a multiplicidade de pontos de entrada através dos quais as práticas são iniciadas; a sua dinâmica ao longo do tempo; o vasto leque de sectores ao longo da cadeia alimentar; a diversidade de recursos financeiros utilizados e combinados. Surpreendentemente, não existem iniciativas ou programa cujo enfoque seja o acesso à terra para produção local¹²⁹.

3. CONSEQUÊNCIAS DA INSUFICIENTE PRODUÇÃO DE ALIMENTOS BIOLÓGICOS LOCAIS

Apresentamos seguidamente três consequências da insuficiente produção de alimentos biológicos locais, todas recaindo na influência das autoridades locais, como iremos explicar:

3.1. Não existem alimentos biológicos locais suficientes para fornecer as cantinas escolares

Respondendo ao interesse pelo consumo de produtos biológicos, o PA da ENAB propõe como um dos seus três objetivos estratégicos (Eixo 2 – promoção e mercados) aumentar o consumo de produtos biológicos (objetivo 2.1.), nomeadamente integrando uma percentagem de produtos biológicos no novo regime do leite e da fruta nas escolas e incentivando a inclusão de produtos biológicos nas ementas das cantinas públicas. No entanto, as autoridades locais que pretendem incluir alimentos biológicos nas ementas das cantinas escolares deparam-se com uma oferta insuficiente. Veja-se a este propósito a análise SWOT que integra o ENAB (ponto 9) ou o trabalho de Sousa (2019).

3.2. A terra pública não é usada como um bem comum

Existe um enorme potencial de recursos fundiários, incluindo terrenos públicos e comunitários (baldios), que não está a ser utilizado para fins produtivos (Allagnat, 2012; Carvalho, 2015; Rodrigo & Rioufol, 2017). Há o risco destes terrenos serem utilizados por interesses privados, por exemplo, imobiliários. No que diz respeito aos baldios, o grande desafio é a reversão do atual uso florestal, cada vez mais explorado por interesses privados e não para as funções comunitárias originais. Voltaremos a este assunto mais tarde.

3.3. A transição agroecológica não está a ser assegurada pelos municípios

Os municípios devem ter uma estratégia alimentar coerente para o seu território no que diz respeito à produção e ao consumo alimentar, capaz de manter a longo prazo a fertilidade dos solos, a biodiversidade, os ecossistemas locais, as necessidades das pessoas e o combate às alterações climáticas (Dubbeling, 2015; Yigitcanlar & Teriman, 2015). Esta visão estratégica é particularmente importante nos municípios onde a agricultura convencional é o principal motor económico ou assume importância significativa.

4. UMA JANELA DE OPORTUNIDADE NA LEGISLAÇÃO EXISTENTE

4.1. Políticas públicas nacionais

Para alterar este cenário é fundamental uma combinação de políticas nacionais e locais. Reconhecemos que o governo central tem trabalhado nesse sentido desde 2017. O Quadro I apresenta uma lista não exaustiva das políticas existentes em vários domínios no âmbito dos solos, da agricultura e da alimentação. Uma janela de oportunidade surge, em particular, com a ENAB e

¹²⁹ Note-se que o projeto desenvolvido pela Empresa Municipal do Ambiente de Cascais – Terras de Cascais – desenvolveu nos finais de 2019 uma plataforma “banco de terras de Cascais” que visa aproximar os proprietários de terras agrícolas de pessoas interessadas em cultivar. A participação de ambas as partes é totalmente voluntária sendo a Empresa Municipal do Ambiente de Cascais apenas responsável pela gestão administrativa da plataforma.

respetivo PA, que inclui várias medidas relativas ao aumento da produção biológica, nomeadamente, produtos hortícolas e frutícolas, como mencionado anteriormente (ver linha 3).

QUADRO 1: POLÍTICAS NACIONAIS EXISTENTES NO ÂMBITO DOS SOLOS, DA AGRICULTURA, DA ALIMENTAÇÃO E AFINS

	Ponto de entrada	Legislação	Potenciais Contributos
1	Solos	<i>Lei de bases do solo, do ordenamento do território e do urbanismo</i> (Lei 99/2019).	Prevê o aumento da área agrícola em modo de produção biológica em conformidade com a ENAB e o PA
2	Solo (rural)	<i>Banco de Terras</i> (Lei 62/2012)	Disponibiliza terrenos agrícolas e florestais para venda ou arrendamento
3	Agricultura	<i>Estratégia Nacional para a Agricultura Biológica e o Plano de Ação para a Produção e Promoção de Produtos Agrícolas e Géneros Alimentícios Biológicos</i> (Resolução de Conselho de Ministros 110/2017)	Prevê um aumento de 12% da SAU em modo de produção biológica até 2027
4	Alimentação Saudável	<i>Estratégia Integrada para a Promoção da Alimentação Saudável</i> (Nº. 11418/2017)	Estimula as compras locais de alimentos; defende maior sensibilização para os alimentos biológicos
5	Abastecimento Alimentar	<i>Estratégia Nacional para as Compras públicas ecológicas</i> (Deliberação do Conselho de Ministros 38/2016)	Defende os circuitos curtos como instrumento de minimização do impacto ambiental na aquisição de alimentos
6	Governança Alimentar	<i>Conselho de Segurança Alimentar e Nutricional</i> (Resolução de Conselho de Ministros 103/2018)	Reconhece a necessidade de uma melhor integração e ligação dos atores e sectores presentemente desconectados, bem como a necessidade de formular e implementar uma política de alimentação sustentável
7	Clima	<i>Roteiro para a Neutralidade Carbónica 2050</i> (Resolução do Conselho de Ministros 107/2019)	Defende o aumento da SAU em modo de produção biológica

Fonte: Autor (2020).

Existe uma quantidade considerável de políticas bem-intencionadas ao nível nacional, cujo sucesso falta avaliar. Evidencia-se uma visão em silos (Rego, 2018) na administração central e local, por oposição a uma visão holística, fundamental em temáticas como a alimentação.

4.2. O interesse das autoridades locais pela alimentação exige maior envolvimento no acesso à terra

Desde 2010 um número crescente de autoridades locais tem desenvolvido um interesse na alimentação e nas hortas urbanas como parte das suas políticas de desenvolvimento local e/ou sustentável (Abreu, 2012; Delgado, 2017; Gonçalves, 2014; Pinto & Ramos, 2008; S. C. A. Rodrigues, 2012). As razões são muito diversas: promoção da coesão social; sensibilização alimentar; saúde; redução do desperdício alimentar; ajuda a grupos vulneráveis. É tempo de expandir esse interesse para uma visão alimentar holística da alimentação que considere uma estratégia alimentar integrada capaz de: promover alimentos biológicos locais nas escolas públicas, restaurantes e mercados locais; desenvolver uma política de acesso à terra para aumentar a oferta local; apoiar as empresas locais e a criação de emprego; promover modos de produção agrícola em linha com critérios ambientais e de preservação dos recursos naturais (por exemplo, terra e recursos hídricos) ou como parte de uma estratégia alimentar e climática¹³⁰.

¹³⁰ A este propósito ver a recente *Declaração de Glasgow sobre Alimentação e Clima* (<https://pt.glasgowdeclaration.org/>). A Declaração já foi assinada em Portugal pelos municípios de Mértola e Torres Vedras (acedido em fevereiro 2021).

4.3. Aumentar a produção local é uma oportunidade para repensar o sistema alimentar

Na ausência de uma política que facilite o acesso à terra local para a produção de alimentos biológicos capaz de assegurar o fornecimento das cantinas escolares, cabe às autoridades locais encontrar os canais para aceder à terra pública para produção local. Uma política de acesso à terra é também uma oportunidade para: aumentar a resiliência e a soberania alimentar dos municípios; criar espaços de aprendizagem no âmbito da alimentação, nutrição, sazonalidade dos alimentos; reforçar a economia verde local; criar um ambiente facilitador para os agricultores agroecológicos; estimular o debate entre os atores locais sobre como fazer a transição para um sistema alimentar integrado.

4.4. As práticas internacionais mostram que uma política pública de abastecimento local é viável

O projeto Urbact BioCanteens Transfer Network (2018), liderado pela cidade francesa de Mouans-Sartoux (10.000 habitantes), tem Torres Vedras como uma das cidades parceiras. As três cantinas escolares de Mouans-Sartoux são abastecidas com produtos 100% biológicos, e na sua maioria produzidos localmente. Desta forma promove-se uma redução drástica do desperdício alimentar, compensando o aumento dos custos dos produtos biológicos. São organizadas atividades educacionais dedicadas à sensibilização para a alimentação sustentável.

Para estabelecer esta política o município comprou, em 2005, quatro hectares de terra, que transformou em 2009 em quinta municipal para abastecimento das três cantinas escolares. Face aos resultados promissores, o município contratou um agricultor com o estatuto de "funcionário municipal". Paralelamente, o município investiu em equipamentos agrícolas.

Em 2009, a produção de 10 toneladas garantiu 30% das necessidades de abastecimento das cantinas escolares. Em 2012, a produção de 15 toneladas cobriu 50% do abastecimento e em 2015 ascendeu a 85% das necessidades (cerca de 1.400 refeições diárias). Em 2016, o município adquiriu mais dois hectares de terra para assegurar 100% dos produtos hortícolas e frutícolas consumidos nas cantinas escolares (Rodrigo & Rioufol, 2017). Mouans-Sartoux é um exemplo de que uma política pública de abastecimento local é viável, assim como, da urgência em considerar a dimensão territorial como parte do sistema alimentar.

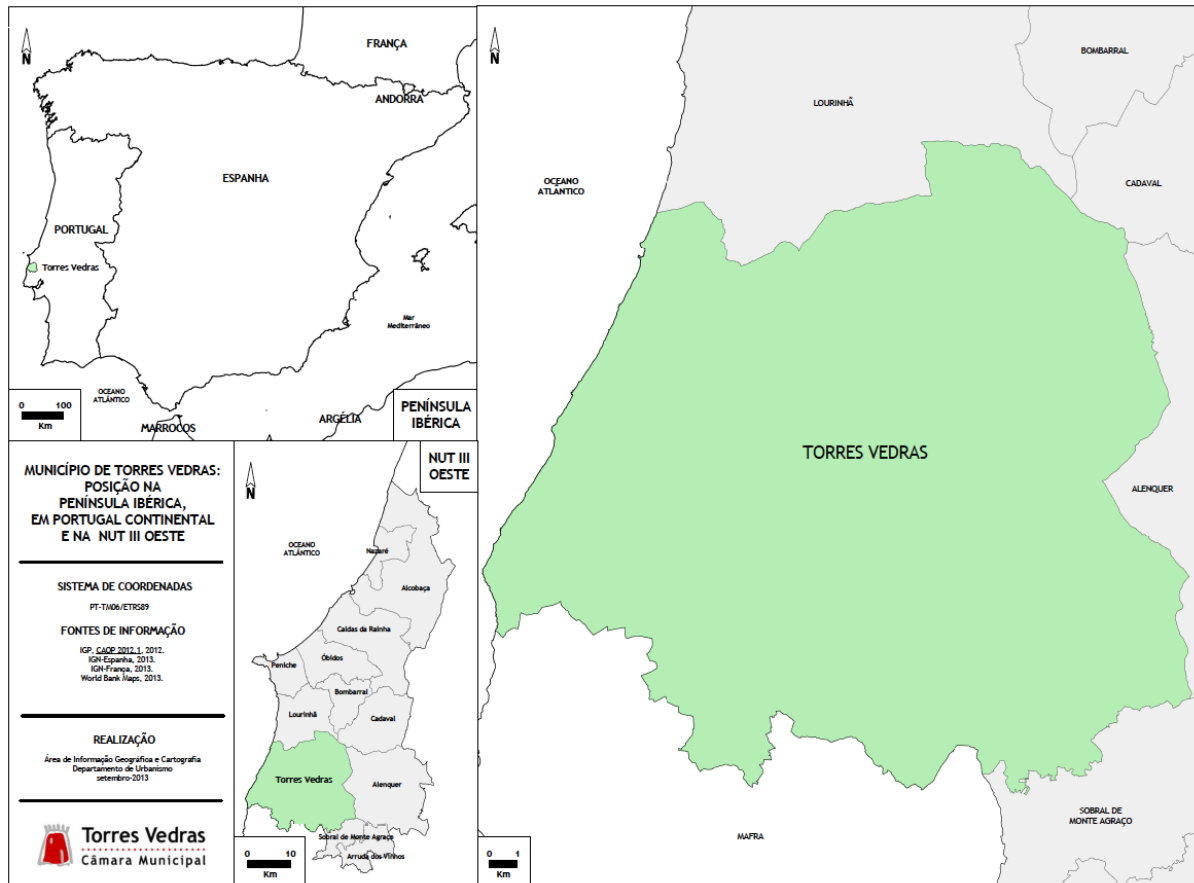
5. PARA UMA POLÍTICA APOIADA NO CONTEXTO LOCAL: TORRES VEDRAS COMO ESTUDO PILOTO

O concelho de Torres Vedras está localizado a 50 km de Lisboa (ver Mapa I) e tem uma população de 78.375 habitantes (PORTDATA, 2019) distribuída por 407 km². A sua principal atividade económica é o sector terciário que emprega 67,1% da população ativa, seguido do sector secundário (26,7%) e, por último, do sector primário (6,2%). A percentagem correspondente ao sector primário é elevada em relação à média nacional (3,1%)¹³¹. Torres Vedras é um dos concelhos que regista maior atividade agrícola em Portugal (6,2%)¹³², sendo dominante o modo de produção convencional.

¹³¹ Dados referentes ao Censos 2011.

¹³² Idem.

MAPA 1: LOCALIZAÇÃO DE TORRES VEDRAS



Fonte: Município de Torres Vedras (2020).

O município iniciou em 2014 o Programa de Sustentabilidade na Alimentação Escolar – PSAE, que visa promover a economia local e a sustentabilidade ambiental e melhorar a alimentação escolar. Em 2018 foram fornecidas 720.000 refeições/ano a 37 jardins de infância e 41 escolas primárias (4170 alunos). Deste total, 1300 refeições são preparadas pela cozinha central municipal e cerca de 2700 refeições são preparadas por associações locais sem fins lucrativos, ao nível das freguesias, como resposta à falta de cozinhas nas escolas (Rodrigues, 2020).

Em 2018 o município iniciou um programa piloto que ambiciona estimular a introdução de produtos biológicos nas ementas das cantinas escolares. Esta ambição é um desafio em face da escassez de fornecimento de produtos locais. Existem duas opções para lidar com este cenário: 1) comprar alimentos biológicos fora dos limites municipais; ou 2) aumentar a produção local de alimentos biológicos, seguindo o modelo do município de Mouans-Sartoux.

O dinamismo de Torres Vedras no âmbito da alimentação justificou a adesão do município a várias redes internacionais, nomeadamente: ao programa URBACT BioCanteens (URBACT, n.d.), liderado por Mouans-Sartoux; ao Pacto de Política Alimentar Urbana de Milão (MUPP, 2015), um protocolo internacional que reúne mais de 200 cidades comprometidas em desenvolver políticas e programas no âmbito da alimentação; e à rede internacional CITYFOOD (RUAF, 2019) coordenada pela RUAF e ICLEI, que visa acelerar a ação dos governos locais e regional no âmbito dos sistemas alimentares cidade-região mais sustentáveis e resilientes. Mais recentemente, o município assinou a Declaração de Glasgow sobre Alimentação e Clima.

6. COMO E ONDE ENCONTRAR TERRA LOCAL? UMA ABORDAGEM MULTIATORES

Para iniciar a abordagem, procedeu-se ao mapeamento dos atores relevantes para o acesso à terra em Torres Vedras, numa perspetiva de abastecimento das cantinas escolares locais. Deste

mapeamento colaborativo resulta uma lista de atores locais baseada na sua relevância, valores e envolvimento, e no reconhecimento da multiplicidade de perspetivas (Taylor, 2019).

O primeiro mapeamento foi realizado com o departamento que coordena o Programa de Alimentação Escolar Sustentável - PSAE. Foram identificados quatro departamentos municipais relevantes: 1) Gestão Urbanística; 2) Educação e Desporto (que coordena o PSAE); 3) Ambiente e Sustentabilidade; 4) Desenvolvimento Social.

De fevereiro de 2020 a março de 2020 realizaram-se as entrevistas semiestruturadas com o objetivo de: identificar potenciais contribuições; discutir e classificar as potenciais políticas para facilitar o acesso à terra; e, por último, identificar outros atores locais a envolver. O Quadro II lista os atores mapeados durante a primeira fase, que progrediu através de um processo de bola de para uma segunda lista de atores. A coluna 5 do Quadro II apresenta os potenciais contributos de cada ator local para uma *política pública de acesso à terra*.

QUADRO 2: DEPARTAMENTOS MUNICIPAIS E OUTROS ATORES LOCAIS A CONSIDERAR NA ELABORAÇÃO DE UMA POLÍTICA PÚBLICA DE ACESSO À TERRA PARA PRODUÇÃO DE ALIMENTOS BIOLÓGICOS LOCAIS (BASEADO EM TORRES VEDRAS)

	Atores – 1ª fase	Sector	N.º Inquiridos	Contributos potenciais
1	Gestão Urbanística	Departamento da Câmara Municipal	1	Mapear as terras disponíveis; identificar as terras aptas para produção agrícola; gerir uma possível estratégia de acesso à terra através da aplicação de “taxas urbanísticas”
2	Educação e Desporto	Departamento da Câmara Municipal	2	Agilizar o abastecimento das cantinas escolares de acordo com a oferta local existente; sensibilizar a comunidade escolar para a sazonalidade e a mais-valia da alimentação biológica; fazer a ponte com os produtores biológicos locais
3	Ambiente e Sustentabilidade	Departamento da Câmara Municipal	1	Identificar áreas florestais municipais que possam ser convertidas em pomares para abastecimento das cantinas escolares; avaliar a qualidade dos solos municipais para produção em modo biológico
4	Desenvolvimento Social	Departamento da Câmara Municipal	2	Facilitar o contacto entre os atores locais, nomeadamente as Juntas de Freguesia
Atores – 2ª fase				
5	Contratação Pública e Património	Departamento da Câmara Municipal	3	Listar os terrenos municipais devolutos e com aptidão agrícola
6	Viveiros / Limpeza urbana / gestão de resíduos urbanos/	Departamento da Câmara Municipal	0	Fornecer árvores de fruto e sementes; capacitar os agricultores para a compostagem
7	Jurídico	Departamento da Câmara Municipal	0	Aconselhamento jurídico sobre o acesso à terra e aquisição pública de alimentos
8	Sistema de informação Geográfica	Departamento da Câmara Municipal	1	Mapear as terras com aptidão agrícola (pública e privada)
9	Mercados e Feiras	Departamento da Câmara Municipal	1	Venda de produtos biológicos locais; ações de sensibilização; promoção da ligação entre agricultores e consumidores
10	Investir Torres Vedras /Farm lab	Vários	1	agricultura digital
Outros atores a envolver				
11	Juntas de Freguesia	Autoridades Locais	3/13	Disponibilizar para produção local os terrenos em regime de baldios; promover o contacto com os proprietários de terra privada
12	Escolas de Agricultura	Sector Privado / Administração	0	Suporte técnico; capacitação; mão-de-obra

		Pública		
13	Proprietários de terras	Sector privado e outros	0	Disponibilizar terra devoluta para produção local
14	Empresas de agricultura e alimentação	Sector privado	2	Suporte técnico; doação de árvores e equipamentos
15	Centro de Emprego e Formação profissional	Administração pública	0	Financiamento; encaminhamento de mão-de-obra
16	Agricultores	Sector privado	2	Mão de obra; garantir a transição da agricultura convencional para o modo de produção biológico no município
17	Comunidade escolar	Administração pública / Sociedade civil	0	Promoção do consumo local e biológico
18	Professores	Administração pública	0	Sensibilizar a comunidade escolar para a relevância de consumir local e biológico
19	Cantinas escolares	Administração pública	0	Garantir a procura de produtos locais e biológico
20	Associação de Baldios – Baladi*	Terceiro sector	1	Apoiar e potenciar a repicção de um projeto piloto que considere os baldios para produção de frutícolas e hortícolas para abastecimento das cantinas escolares
21	Instituto de Conservação da Natureza e das Florestas	Administração central	1	Replicação nacional do projeto piloto; mapeamento dos baldios existentes (conforme previsto na lei 75/2017); apoio jurídico
22	Restaurantes locais	Sector privado	0	Promoção do consumo local e biológico
23	Residentes / consumidores	Sociedade civil	0	Promoção do consumo local e biológico

Fonte: Autor (2020).

Na primeira fase das entrevistas a participação do representante do Departamento de Gestão Urbanística foi de extrema relevância para a construção de uma estratégia de acesso à terra. Por exemplo, permitiu compreender que os recursos fundiários (terra) estão sob responsabilidade do Departamento de Aquisição Pública e Património. Em reunião posterior com o mencionado departamento verificou-se a ausência de terrenos municipais disponíveis a curto prazo, mas, em compensação, soubemos da existência de baldios, i.e., terrenos comunitários numa das 13 freguesias do município.

Ao longo das entrevistas com os representantes dos departamentos municipais observou-se um enorme potencial de colaboração e equipas técnicas extremamente motivadas. Simultaneamente, verificou-se um desconhecimento significativo dos projetos em curso noutros departamentos. Sublinhe-se que a “janela de oportunidade para aceder à terra” surgiu numa segunda fase das entrevistas, por sugestão de um ator entrevistado na primeira fase, o que confirma a relevância da abordagem multiatores como metodologia de desenvolvimento de políticas intersectoriais.

Na segunda fase entrevistaram-se três representantes das 13 Juntas de Freguesias que compõem Torres Vedras, tendo sido encontradas dois tipos de regime fundiário: 1) terras comunitárias; 2) terras doadas por proprietários privados. De acordo com a informação disponibilizada pelos presidentes das Juntas de Freguesia, ou representantes, a União das Freguesias de Carvoeira e Carmões é proprietária de 39 hectares de baldios devolutos (distribuídos em dois lotes) e a Freguesia de Turcifal proprietária de 46 hectares devolutos. Na União das Freguesias de Campelos e Outeiro da Cabeça foi identificado um terreno disponível de 1,3 hectares que resultou de uma doação à Junta de Freguesia. Tendo-se confirmado que apenas as duas freguesias referidas são proprietárias de terrenos baldios, e sendo as áreas disponíveis suficientes para responder ao problema identificado, não foram feitas pesquisas adicionais relativamente a outros potenciais terrenos.

7. OS BALDIOS EM PORTUGAL: HÁ TERRA COMUNITÁRIA POR CULTIVAR

Os baldios são uma tradição milenar em Portugal, que remonta à Idade Média (Baptista & Oliveira Baptista, 2014; Brouwer, 1999; Lopes et al., 2013). O ano de 1936 constitui um marco no mapeamento dos baldios e, à data, o único mapeamento ao nível nacional disponível. Nesse ano foi estabelecida pelo “Estado Novo” a Junta de Colonização Interna, com o objetivo de “Proceder ao reconhecimento e constituição de reservas de terrenos baldios do Estado e dos órgãos administrativos que possam ser utilizadas para constituição de casais agrícolas, tendo em conta a natureza do terreno, a sua extensão e os benefícios dos povos no que se refere ao seu gozo atual” (Ministério da Agricultura, 1939). Pretendia-se identificar os baldios para melhor definir uma estratégia nacional de abolição dos mesmos (Paiva et al., 2019).

A decisão desencadeou um forte sentimento de revolta e originou uma crise temporária no governo. As manifestações foram reprimidas com violência, mas os baldios sobreviveram (Nunes, 2020). De acordo com Barros (2012), foi a campanha mais opressora até à data tendo como objetivo eliminar os usos tradicionais dos baldios, i.e., o pastoreio, a apanha de lenha e os cultivos pelas comunidades locais. Simultaneamente, procedeu-se ao florestamento de mais de 400.000 hectares, o que obrigou muitas comunidades locais a deixar o pastoreio (Paiva et al., 2019).

Após a Revolução de 25 de abril de 1974, o papel económico e social dos baldios foi reconhecido pelo Estado e incorporado na Constituição da República Portuguesa aprovada em 1976. A legislação mais recente, Lei 75/2017 de 27 de dezembro, previa uma plataforma pública com a georreferenciação de todos os baldios existentes, no prazo de 120 dias após a publicação da lei, ou seja, finais de 2017 (artigo 9º). Esta plataforma permitiria quantificar e caracterizar os terrenos baldios existentes em Portugal. Dado que esta plataforma não foi executada, a informação mais atualizada continua a ser o levantamento realizado em 1939 pela Junta de Colonização Interna. De acordo com o “Reconhecimento dos Baldios no Continente” (Ministério da Agricultura, 1939), existiam então 407.541,99 hectares de baldios em Portugal.

O Mapa II localiza e quantifica os baldios no território continental a partir da base distrital. A informação está também disponível por concelhos e freguesias. Por exemplo, em 1939 existiam no concelho de Cascais 403,58 hectares de baldios¹³³. Por outro lado, em Torres Vedras existiam 153,34 hectares de baldios em 1939, e atualmente existem 172,00 hectares, ou seja, uma área muito superior. Esta atualização só foi possível ser efetuada para Torres Vedras e a evolução ocorrida desde 1939 poderá variar significativamente de município para município.

¹³³ Seria interessante investigar quais as atividades desenvolvidas nos terrenos baldios pelo município de Cascais e se alguma relação existe com o programa de Agricultura Urbana desenvolvido localmente.

MAPA 2: BALDIOS - HECTARES POR DISTRITO EM PORTUGAL CONTINENTAL (1939)



Portugal (Continente) - Distritos	Área em baldios (hectares)
Vila Real	107.005,13
Viseu	73.391,35
Viana do Castelo	56.587,58
Coimbra	34.241,58
Guarda	29.360,99
Bragança	25.233,16
Leiria	19.616,99
Santarém	14.024,66
Castelo Branco	13.216,97
Aveiro	8.760,50
Beja	7.156,00
Braga	6.140,09
Faro	4.244,00
Portalegre	3.682,23
Porto	2.530,12
Lisboa	1.225,51
Évora	940,89
Setúbal	184,24
Total	407.541,99

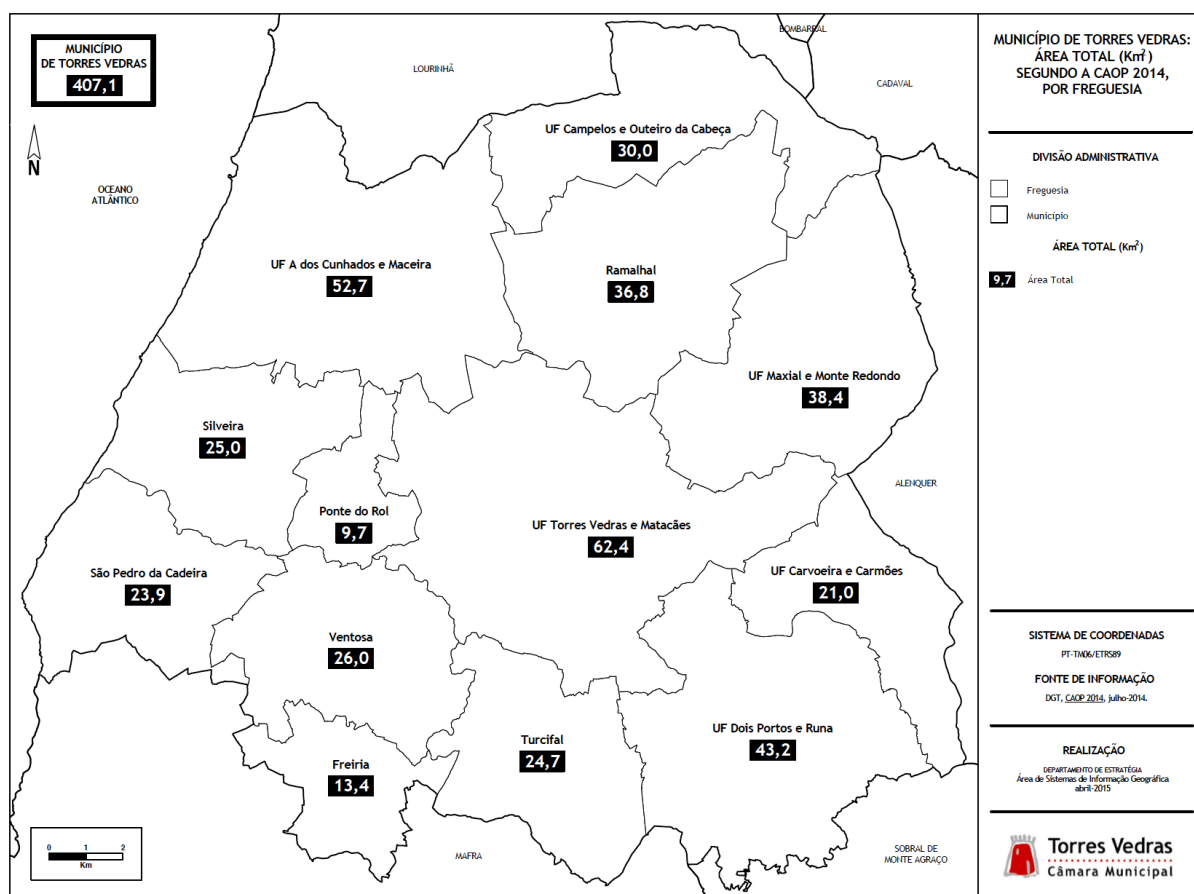
Fonte: Adaptação do autor a partir dos três volumes da publicação Reconhecimento dos Baldios no Continente (Ministério da Agricultura, 1939).

7.1. Baldios disponíveis em Torres Vedras

Em Torres Vedras, os baldios estão localizados em duas freguesias: União de Freguesias da Carvoeira e Carmões e Freguesia do Turcifal, totalizando atualmente 172,00 hectares. No entanto a área devoluta é bastante menor: 39 hectares no primeiro caso e 46 hectares no segundo (ver Mapa III).

Na parcela devoluta da União de Freguesia da Carvoeira e Carmões o presidente pondera a possibilidade de ser desenvolvido um projeto turístico. Na parcela ocupada há uma exploração eólica e um parque de lazer. Na freguesia do Turcifal existe uma parte significativa do baldio ocupada por uma exploração florestal privada. Há também um projeto em desenvolvimento para um pomar. Restam 46 hectares devolutos, que poderiam ser disponibilizadas para a produção local de alimentos biológicos para abastecer as cantinas locais, em particular produtos hortícolas e frutícolas. De acordo com o representante da freguesia do Turcifal, os recursos humanos podem ser obtidos através de estágios do Instituto de Emprego e Formação Profissional para a agricultura.

MAPA 3: FREGUESIAS DE TORRES VEDRAS COM BALDIOS



Fonte: Município de Torres Vedras (2020).

Se no caso piloto de Torres Vedras o uso dos baldios é um cenário que deverá ser fortemente ponderado, haverá municípios em que esta solução não se aplica. Outras políticas deverão ser ponderadas como passaremos a descrever. Estas políticas podem ser implementadas em articulação não sendo mutuamente exclusivas.

8. QUATRO POTENCIAIS POLÍTICAS PÚBLICAS DE ACESSO À TERRA PARA PRODUÇÃO LOCAL

As quatro políticas foram discutidas com os atores listados no Quadro II, de modo a aferir a sua adequação e relevância no contexto local. Apresenta-se de seguida uma descrição crítica de cada uma das políticas com base nas entrevistas e nos contributos recebidos.

Opção Política 1 - Autarquias locais como mediadoras no processo de acesso à terra - Esta política implica que as autoridades locais (municípios e freguesias) facilitem o acesso à terra através da constituição de uma base de dados de terra pública (prioritariamente) e privada com aptidão agrícola. As autoridades locais devem ser os mediadores entre os proprietários da terra e os agricultores que procuram terra local para produção biológica. As autoridades locais devem salvaguardar que os agricultores se comprometem a abastecer as cantinas escolares locais.

Esta política envolve vários departamentos municipais, juntas de freguesia, proprietários de terra, agricultores, entre outros atores locais. O Departamento Jurídico municipal é capital para a definição dos estatutos de uso da terra e a garantia do compromisso de que essa produção será prioritariamente encaminhada para o abastecimento das cantinas escolares locais.

- **Listagem sumária das ações necessárias:** 1 - Identificar e mapear as terras disponíveis e com aptidão para a agricultura biológica (pública e privada) com o envolvimento do departamento de gestão urbanística, divisão de património e a equipa do Sistema de Informação Geográfica; 2 –Facilitar o processo de ligação entre a “oferta de terra” e a “procura de terra”; 3 – Elaborar os procedimentos de fornecimento às escolas pela entidade responsável.
- **Potenciais limitações:** 1 - Requer alguém que conheça o território; 2 – Dificuldades no envolvimento dos proprietários de terras.
- **Oportunidades:** O reduzido orçamento necessário para alavancar a política.

Opção Política 2 - Desincentivos fiscais para tornar as terras urbanas devolutas atrativas para utilização agrícola - Pretende-se reduzir a atratividade da manutenção de terrenos urbanos em estado devoluto, através do aumento do Imposto Municipal sobre Imóveis - IMI¹³⁴. Esta política exige vontade política e coordenação entre diferentes entidades, nomeadamente dos Municípios, das repartições de Finanças e do Governo Central.

- **Listagem sumária das ações necessárias:** 1 – Mapear e cruzar informação cadastral entre o registo da matriz predial dos imóveis (urbano vs. rustico) e o zonamento do imóvel no âmbito do Plano Diretor Municipal (urbano vs. não urbano); 2 - Mapear todos os terrenos urbanos no PDM devolutos e aptos para a agricultura biológica; 3 – Verificar se esses terrenos pagam impostos nos serviços de Finanças (IMI) correspondentes à classificação no PDM como prédios urbanos e não como rústicos¹³⁵; 4 - Aumentar o IMI dos terrenos urbanos devolutos e com aptidão produtiva e/ou redução do IMI caso o terreno seja usado para fins produtivos. Esta redução deve depender do tempo de uso para fins produtivos estabelecido no contrato de arrendamento.
- **Potenciais limitações:** 1 – Tempo do processo; 2 - Política com algum risco de impopularidade; 3 - Envolve o governo e a administração central.
- **Oportunidades:** Em cidades fortemente urbanizadas poderá ser a única forma de acesso à terra para produção agrícola e um modelo de combate à especulação imobiliária.

Opção Política 3 - Apoiar a conversão da agricultura convencional para agricultura em modo de produção biológica - Embora esta medida esteja prevista na Estratégia e no Plano de Ação para a Agricultura Biológica, o papel das autoridades locais é fundamental no apoio à conversão dos agricultores através, por exemplo, de apoios monetários à certificação biológica, a ações de sensibilização ou a campanhas de marketing. A adesão dos agricultores é voluntária o que não garante resultados a curto-médio prazo. Esta política exige o envolvimento de vários atores e sectores, nomeadamente agricultores convencionais, serviços do Ministério da Agricultura (governo central) e empresas de formação e certificação biológica.

¹³⁴ O Imposto Municipal sobre Imóveis (IMI) abrange simultaneamente os proprietários de edifícios e terrenos.

¹³⁵ Cujo valor pago é inferior a um terreno urbano.

- **Listagem sumária das ações necessárias:** 1 – Desenvolver campanhas de sensibilização dos agricultores; 2 – Realizar eventos públicos com consumidores para fomentar a procura local de alimentos biológicos; 3 – Capacitar agricultores para a conversão; 4 – Disponibilizar apoios financeiros à conversão e certificação.
- **Potenciais limitações:** 1 – Tempo do processo; 2 - Em municípios, como Torres Vedras, onde a agricultura convencional representa um sector económico forte, os produtores podem não estar sensibilizados para a conversão.
- **Oportunidades:** Do ponto de vista ambiental, a conversão para a agricultura em modo de produção biológica pode ser extremamente positiva. Do ponto de vista económico pode ser atrativa a médio/longo prazo.

Opção Política 4 - Permutar taxas urbanísticas por terra com aptidão para produção em modo biológico - A legitimação desta medida política exige a elaboração e aprovação prévia, pelo município, de uma Estratégia Alimentar Local Integrada, que considere o acesso à terra agrícola como uma prioridade. Debaixo do chapéu desta Estratégia os serviços urbanísticos poderão validar a troca de taxas urbanísticas por terra com aptidão agrícola.

- **Listagem sumária das ações necessárias:** 1 - Desenvolver uma estratégia alimentar municipal colaborativa envolvendo departamentos municipais e atores locais, tendo o acesso à terra como prioridade; 2 – Quantificar a terra necessária ao abastecimento de produtos frutícolas e hortícolas das cantinas escolares; 3 - Definir e implementar, ao nível municipal, o mecanismo de transferência de imposto fundiário adequado.
- **Potenciais limitações:** 1 – Tempo do processo; 2 - Poderá ser difícil chegar a um consenso relativamente à visão estratégica e à identificação das ações prioritárias; 3 – Garantir terra suficiente com aptidão para produção em modo biológico.
- **Oportunidades:** A elaboração de uma Estratégia Alimentar garante o consenso e aceitação da política entre os atores locais e facilita que a política prevaleça para além do ciclo eleitoral.

8.1. Matriz de comparação das diferentes opções de políticas públicas de acesso à terra

O Quadro III apresenta uma análise multivariável das quatro potenciais políticas de acesso à terra, com base na literatura (Young & Quinn, 2012) e no debate havido com os atores locais. Consideraram-se cinco variáveis: 1. Quantidade; 2. Tempo; 3. Viabilidade institucional; 4. Custo; 5. Aceitação pública. Para cada variável foram estabelecidos os critérios descritos seguidamente:

- **Quantidade** (2 critérios) – (a) hectares de terra; (b) toneladas de frutícolas e hortícolas que podem ser produzidos¹³⁶.
- **Tempo** (4 critérios) – (a) tempo necessário à identificação do terreno; (b) tempo do ciclo produtivo; (c) tempo político, i.e., período eleitoral de 4 anos; (d) tempo de aprovação institucional das medidas necessárias.
- **Viabilidade institucional** (3 critérios) – (a) enquadramento político; (b) operacionalização das ações; (c) recursos humanos necessários.
- **Custo de implementação** (1 critério) – (a) orçamento necessário para implementar a política.
- **Aceitação pública**¹³⁷ (1 critério) – (a) grau de aceitação da política por parte da comunidade.

¹³⁶ Cálculo efetuado com base na experiência de Mouans-Sartoux, considerando a meta de abastecimento de 100% de produtos hortícolas e frutícolas biológicos para confeccionar 6.000 refeições diárias em Torres Vedras. Perfaz 20 hectares de área necessária e corresponde à produção anual de 60 toneladas anuais de produtos hortícolas e frutícolas.

¹³⁷ A aceitação pública corresponde ao conjunto dos atores inquiridos (ver Quadro II). A desagregação por proprietários, produtores, comunidade e outros não foi possível nesta fase.

QUADRO III – MATRIZ DE COMPARAÇÃO DAS QUATRO POLÍTICAS PÚBLICAS DE ACESSO À TERRA PROPOSTAS TENDO COMO REFERENCIAL O PROGRAMA ATUAL – PSAE (TORRES VEDRAS)

		Critério de avaliação	Programa atual - PSAE	Opção Política 1 - Autoridades locais como mediadoras no processo de acesso à terra	Opção Política 2 - Desincentivos fiscais para tornar as terras urbanas devolutas atrativas para utilização agrícola	Opção Política 3 - As autoridades locais apoiam a conversão da agricultura convencional para agricultura biológica	Opção Política 4 - Troca de taxas urbanísticas por terra com aptidão para produção em modo biológico
Quantidade	1.1	Hectares disponíveis imediatamente	Não aplicável – N/A	Previsto um número significativo de hectares. E.g., em Torres Vedras a área devoluta em regime de baldios é superior à necessária para abastecer as cantinas escolares	Impossível aferir – I/A	Depende da vontade do individual do agricultor. Não é possível determinar áreas	Não é possível determinar nesta fase
	1.2	Hortícolas e frutícolas	N/A	100% calculado com base na terra disponível em regime de baldios	I/A	Não é possível determinar nesta fase	Não é possível determinar nesta fase
Tempo	2.1	Para alcançar os hectares de terra	Longo. Depende da vontade de terceiros	Curto. A autoridade local tem um papel facilitador e de alavancagem	Longo. Ultrapassa a jurisdição das autoridades locais. I/A	Médio. Ultrapassa a jurisdição das autoridades locais	Médio, se apoiado por vontade política
	2.2	Para obter a produção	N/A	Curto	Longo	Médio	Médio
	2.3	Ciclo político	N/A	Curto. Pode ser alcançado num ciclo político	Longo. Difícil de ser alcançado num ciclo político	Curto. Pode eventualmente ser alcançado num ciclo político	Médio. Pode eventualmente ser alcançado num ciclo político
	2.4	Para aprovação institucional	N/A	Curto. Exige apenas vontade política para iniciar o processo	Longo. Envolve vários atores. Ultrapassa a jurisdição das autoridades locais	Médio. Ultrapassa a jurisdição das autoridades locais	Médio. Exige vontade política para iniciar o processo

Viabilidade	3.1	Institucional interna	N/A	Médio. Requer colaboração interdepartamental e com atores externos	N/A	N/A	Médio/Longo. Requer colaboração interdepartamental e com atores externos e a construção de uma visão/ estratégia alimentar para o município
	3.2	Institucional externa	N/A	Curto. Caso exista terra pública disponível	Longo. Envolve várias instituições com valores e tempos diferentes	Médio/Longo. Implica o envolvimento voluntário de instituições externas e dos agricultores	Médio. Pode gerar conflitos entre atores com diferentes valores que terão que ser conciliados
	3.3	Recursos humanos	N/A	Implica alguém com capacidade de facilitação/mediação	Numa 1.ª fase apenas o departamento de ordenamento territorial	Não envolve recursos humanos municipais	Implica alguém com capacidade de facilitação/mediação
Custo	4.1	Orçamento para implementação	N/A	Os custos podem ser internalizados	Não implica custos para o município. Pode significar um aumento de taxas em caixa para o município	Pode implicar custos para o município se este optar por apoiar financeiramente a conversão dos agricultores	Poderá ter custos em relação à contratação de um facilitador externo
Aceitação	5.1	Aceitação pública	I/A	Muito forte. De acordo com os atores inquiridos esta proposta é considerada como a primeira opção	De acordo com os atores inquiridos esta proposta pode ser bastante fraturante	De acordo com os atores inquiridos esta proposta é considerada como segunda opção	Forte. Se acompanhada pela elaboração de uma estratégia alimentar integrada que envolva todos os atores locais

Legenda: Longo prazo – mais de 3 anos; médio prazo – entre um e três anos; Curto prazo – menos de um ano.

Elaborado pelo autor (2020).

Em resumo, podem ser aplicadas diferentes políticas para o mesmo objetivo, i.e., há que adequar a solução ao contexto territorial, social e político. Por exemplo, ter as “autoridades locais como facilitadores do acesso à terra” é a melhor opção se existirem terras públicas disponíveis ou se o nível de sensibilização dos proprietários privados para a temática for elevado. A opção por **“Desincentivos fiscais para tornar as terras urbanas devolutas atrativas para utilização agrícola”** exige um elevado investimento político e uma forte concertação das partes envolvidas, sendo mais fácil de implementar ao nível do governo central. A opção por **“Apoiar a conversão da agricultura convencional para agricultura em modo de produção biológica”** pode ser a melhor opção se não existir terra devoluta disponível e existir um forte compromisso político no âmbito da transição ecológica. Por fim, consideramos que “Permutar taxas urbanísticas por terra para produção local em modo biológico” é a opção que melhor consubstancia uma visão estratégica da alimentação, no entanto poderá ser um processo demorado e difícil de conciliar com uma administração pública fortemente conservadora, hierarquizada e sem uma visão intersectorial e multiatores da alimentação.

No contexto de Torres Vedras, consideramos que a política mais adequada é envolver as **“Autoridades Locais como mediadoras no processo de acesso à terra”** (opção política 1). Suportamos a nossa opção nas seguintes premissas:

- **Tempo** - Todas as restantes opções políticas implicam mais tempo de execução, nomeadamente para: (a) alcançar a área de terra necessária e apropriada para cultivo; (b) aprovar os procedimentos institucionais, dado o número elevado de atores e entidades envolvidos.
- **Cooperação** - As três opções políticas não seleccionadas exigiriam muito mais cooperação entre instituições e departamentos, o que, atendendo à cultura institucional portuguesa pouco aberta à colaboração interdepartamental, interinstitucional e intersectorial, é certamente um desafio acrescido.
- **Recursos humanos** - Por fim, qualquer das restantes três opções implica maior envolvimento de recursos humanos, seja da parte do município ou de entidades externas. Este cenário não é o ideal face aos limitados recursos humanos dos municípios portugueses.

Concluindo, as restantes três políticas exigem mais tempo, cooperação e recursos humanos. No entanto, cabe a cada município optar pela política mais adequada ao seu território.

9. AS AUTORIDADES LOCAIS COMO MEDIADORAS DE UMA POLÍTICA PÚBLICA

Com base na estrutura departamental do Município de Torres Vedras, e retomando os contributos potenciais de cada ator local, apresenta-se uma lista não exaustiva das etapas necessárias à operacionalização da política 1 – “Autoridades locais como mediadoras no processo de acesso à terra”:

- Definir um mediador do município (interno ou externo) para coordenar os acordos de uso da terra;
- Definir o modelo de parceria entre o município e os agricultores e os proprietários dos terrenos privados;
- Definir um orçamento para a implementação da política que considere os vários departamentos municipais;
- Envolver os vários departamentos municipais na política pública, nomeadamente:
 - a) O Departamento de Gestão Urbanística e Sistema de Informação Geográfica, na identificação e mapeamento dos terrenos públicos devolutos (incluindo os baldios geridos pelas Juntas de Freguesia);
 - b) O Departamento de Planeamento Estratégico e Territorial, na georreferenciação dos terrenos privados disponíveis;
 - c) O Departamento Jurídico, no enquadramento legal do uso do solo e do estabelecimento de parcerias com os agricultores;
 - d) A Divisão do Ambiente e Sustentabilidade, particularmente na análise da qualidade do solo, campanhas de sensibilização, etc.;

- e) A Divisão responsável pela gestão do abastecimento escolar, na inventariação das necessidades alimentares da comunidade escolar;
- f) A Divisão de Contratação Pública e Património, no âmbito da contratação pública e coordenação com os fornecedores locais;
- g) Os Viveiros municipais, no fornecimento de sementes e árvores de fruto, acompanhamento técnico, etc.;
- h) A Divisão Financeira, na definição e alocação da verba orçamental;
- i) A Divisão de Infraestruturas Municipais e Edifícios, no apoio à construção de infraestruturas, tais como vedações ou fornecimento de água;
- j) A Divisão de Recursos Humanos, no processo de enquadramento institucional e recrutamento de agricultores, etc.;
- k) A Divisão de Comunicação, no desenvolvimento de campanhas de sensibilização para o consumo local de alimentos locais, biológicos e sazonais, e na divulgação local e nacional do projeto.

Outros atores a envolver de acordo com o mapa de atores de Torres Vedras:

- As Juntas de Freguesia, no mapeamento da terra, inventariação da mão-de-obra e maquinaria disponível;
- As organizações sem fins lucrativos, na inventariação e quantificação das necessidades alimentares, mas também na inventariação de mão-de-obra potencial;
- As empresas agrícolas e alimentares locais, no apoio técnico e patronato no âmbito de ações de responsabilidade social;
- A Escola agrícola local, no apoio técnico e eventual mão de obra no âmbito de estágios profissionais;
- Os agrupamentos escolares, na sensibilização da comunidade escolar, discentes, não discentes, alunos e famílias para a relevância do consumo de produtos locais e biológicos.

9.1. Argumentos para o desenvolvimento de uma política pública de acesso à terra agrícola pelas Autoridades Locais

As autoridades locais devem ser agentes proactivos na facilitação do acesso à terra e na atração de novos agricultores. Para que isto aconteça é necessário: vontade política; pensamento estratégico; e abertura à cooperação de todos os atores do sistema alimentar na construção de uma estratégia alimentar integrada que considere a agricultura biológica e o acesso à terra como imperativos sociais.

Do ponto de vista político das autoridades locais, existem pelo menos quatro argumentos para fundamentar uma política pública de acesso à terra para produção de alimentos biológicos para abastecer as cantinas escolares:

A terra não utilizada é um recurso desperdiçado e uma oportunidade de intervenção perdida - A terra pública e os baldios devem ser reapropriados para funções de interesse coletivo, nomeadamente para fornecer as cantinas escolares; há uma necessidade urgente de resgatar o significado comunitário dos baldios – cultivar alimentos para as crianças é uma forma legítima de o fazer; os baldios estão em risco de serem privatizados, é urgente uma ação interventiva das autoridades locais.

As lições aprendidas com as crises sublinham que os sistemas alimentares locais têm de ser resilientes - As autoridades locais devem agir proactivamente em relação às necessidades alimentares das suas comunidades. Não basta assegurar o fornecimento de alimentos de proveniência indiferenciada em situações de crise. É essencial garantir a capacidade produtiva local a médio-longo prazo através do acesso à terra agrícola. Cultivar os alimentos para os nossos filhos é um ponto de partida consensual!

O orçamento necessário para iniciar o processo é insignificante - Numa fase piloto é fundamental vontade política e uma pessoa com capacidade de negociação entre as partes envolvidas que represente o município. Os restantes recursos necessários poderão ser obtidos internamente, por exemplo, as árvores para plantação de pomares serem fornecidas pelos viveiros municipais.

Pode ser implementada de imediato e com resultados visíveis na próxima colheita - Após a disponibilização da terra os resultados são alcançados no tempo de uma colheita agrícola. Em síntese, os resultados da medida política estão aptos a ser divulgados no prazo do ciclo político.

10. O TEMPO PARA AGIR É AGORA: APELO À AÇÃO!

Defendemos um Apelo à Ação com base nas cinco recomendações seguintes:

Envolver os atores locais no debate e na definição de uma estratégia alimentar integrada - O debate deve centrar-se, principalmente, na forma como cada um dos atores pode contribuir para a construção de um sistema alimentar local resiliente, baseado no acesso à terra para produção de alimentos biológicos para consumo local. Simultaneamente, as autoridades locais devem facilitar a coprodução de uma estratégia alimentar para o seu território, que considere as atividades e os atores do sistema alimentar existentes e a visão pretendida para o futuro da alimentação no seu município.

Facilitar o acesso às terras com capacidade de uso agrícola, especialmente terra pública - As autoridades locais devem facilitar o acesso à terra através das seguintes ações imediatas: 1) Mapear e disponibilizar os terrenos públicos devolutos (sejam da Câmara ou das Juntas de Freguesia), com potencial agrícola; 2) Mapear as terras privadas devolutas e com potencial agrícola e sensibilizar os seus proprietários para a utilidade coletiva da terra, nomeadamente através do uso temporário para fins agrícolas.

Promover uma agricultura regenerativa e desenvolver a economia verde local - A atração de novos agricultores é uma oportunidade para a transição intergeracional da agricultura e o desenvolvimento da economia verde local. As autoridades locais devem facilitar o acesso à terra por um período específico, e oferecer oportunidades de aprendizagem, e.g. agricultura regenerativa, produção biológica, agroecologia, etc. Em troca, deve ser estabelecido um plano de produção com o Município, que garanta o fornecimento de alimentos locais e biológicos às cantinas escolares.

Garantir a procura de alimentos biológicos locais para as cantinas e os refeitórios públicos - Para estimular a oferta e a procura de alimentos biológicos locais, as autoridades devem ter um papel proactivo na promoção do consumo local. Várias medidas podem ser adotadas: 1) promover a aquisição de uma percentagem significativa de alimentos biológicos locais pelas cantinas e refeitórios públicos¹³⁸; 2) promover cadeias de abastecimento curtas locais; 3) promover a agricultura biológica local nos mercados e feiras municipais.

Sensibilizar as comunidades para a alimentação saudável, sustentável, sazonal e local - As autoridades locais devem fomentar campanhas de educação pública centradas nos benefícios, para a saúde, para o ambiente e para a economia local, da alimentação biológica local e sazonal. As escolas locais, e todas as crianças da comunidade, devem ser incentivadas a visitar as explorações agrícolas através de dias abertos à comunidade.

11. PRÓXIMOS PASSOS: O QUE SE SEGUE?

Argumentamos que o momento de agir é agora. A pandemia catapultou para o debate a urgência de maior resiliência e autossuficiência dos sistemas alimentares locais. Neste sentido, existe uma janela de oportunidade - o momento para agir localmente é agora!

As autoridades locais têm um papel crucial na implementação de políticas públicas de acesso à terra para produção local. Com base no estudo piloto de Torres Vedras, reconhecemos que as autoridades locais, organizações locais, agricultores, consumidores e académicos possuem competências únicas que precisam de ser consideradas e combinadas para desenvolver um sistema alimentar local mais eficaz e sustentável.

Em paralelo, reconhecemos que existe um conjunto significativo e estimulante de políticas nacionais que advogam mais produção nacional, nomeadamente em modo de produção biológico, embora exista um fosso entre boas intenções e instrumentos de implementação claros. Por fim, reconhecemos também que as mudanças requerem vontade política e empenho e que são mais fáceis ao nível local, onde as estruturas de tomada de decisão são mais leves e as ligações entre as partes interessadas mais fáceis de construir.

¹³⁸ Sublinhe-se que 2021 é o ano internacional das frutas e vegetais, neste sentido este apelo responde ao eco da FAO.

O que se segue? As políticas alimentares devem ser pensadas como dinâmicas e baseadas num reajustamento constante apoiado em provas do que funciona e do que não funciona. Portugal tem a oportunidade de aprender com os países onde estes processos estão mais avançados.

Após mais de 20 anos de políticas alimentares, a alimentação conquistou o seu espaço e é hoje uma área de atuação consagrada em muitos governos locais nos Estados Unidos da América (Gaspard, 2020). Não obstante a sua legitimação como política local e/ou nacional, as lições aprendidas revelam que:

Ponto 1 - O tema da alimentação ainda depende da existência de apoio político para se afirmar na agenda. Consequentemente, cada vez que ocorre uma alteração de ciclo político existe o risco de o tema perder relevância. Em síntese, o “para-arranca” continua a ser um desafio para as políticas alimentares.

Ponto 2 - As políticas refletem os valores e os interesses de quem participou no processo de decisão. Portanto, se o processo, e.g. elaboração da estratégia alimentar do município, não foi transparente e não assegurou que todas as partes interessadas foram envolvidas de forma igualitária, existe o risco de que uma política “bem-intencionada” seja um instrumento adicional de injustiça e segregação.

Ponto 3 – As autoridades locais devem ser mais reflexivas em relação às políticas alimentares. Neste processo a partilha de experiências¹³⁹, retirando as devidas lições com os fracassos e os sucessos, é extremamente importante. Os processos de monitorização e avaliação estão no centro de uma política reflexiva e são instrumentais para a correta definição da próxima geração de políticas alimentares.

Estes três pontos que são um desafio e uma oportunidade para o futuro das políticas alimentares em Portugal!

AGRADECIMENTOS

Agradeço à Câmara Municipal de Torres Vedras, nomeadamente à Vereador Laura Rodrigues, que gentilmente permitiu e incentivou a participação das equipas departamentais na discussão; aos presidentes e vice-presidente das juntas de freguesias de Turcifal, União de Freguesias de Carvoeira e Carmões e Campelos e Outeiro da Cabeça; a todos os restantes atores locais; e à Fundação Calouste Gulbenkian, que através do Programa LEAP – Policy Development Initiative viabilizou o desenvolvimento deste Policy Study.

Um agradecimento muito especial ao meu mentor temático Andreas Kraemer pelo seu acompanhamento e motivação para o desenvolvimento desta proposta. Por fim gostaria de reconhecer o contributo das sugestões dos revisores científicos para esta versão.

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¹³⁹ A este propósito, refira-se que o Despacho n.º 9093/2017, de 16 de outubro, em linha com a Estratégia Nacional para a Agricultura Biológica (ENAB) e o seu Plano de Ação, criou o Observatório Nacional da Produção Biológica, através do qual se pretende recolher, tratar e divulgar num portal de livre acesso a informação disponível sobre produção, transformação e comercialização de produtos biológicos, incluindo sobre o seu consumo e os vários mercados existentes. Até à data (2021) o referido portal não se encontra ainda acessível, malgrado o prazo estabelecido já ter sido ultrapassado.

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AVISO LEGAL

- Este documento resultou da participação do autor no programa da Fundação Calouste Gulbenkian - LEAP – Policy Development Initiative - um programa de capacitação para a elaboração de recomendações de políticas públicas com base em informação factual para investigadores e colaboradores de organizações não-governamentais, de universidades e da administração pública, nos temas da produção e do consumo sustentáveis. O conteúdo e as opiniões expressas neste documento são da responsabilidade do seu autor e não refletem necessariamente a posição da Fundação Calouste Gulbenkian ou dos seus parceiros de projeto.
- A investigadora é contratada pela FCSH ao abrigo da norma transitória - Contrato - [FCSH001730] e afiliada do CICS.NOVA, Centro Interdisciplinar de Ciências Sociais da UNL.
- Partes deste artigo foram publicados em Inglês na revista *Ciudades*, nº24 – Sujeito à licença “Creative Commons Atribución-No Comercial 4.0 Internacional” (CC BY-NC 4.0). Ver: Delgado, Cecília (2021), “How to access land for producing organic food? Land policy options grounded in Torres Vedras, Portugal”, *Ciudades*, nº24, pp. 99-118. DOI: <https://doi.org/10.24197/ciudades.24.2021.99-118>.



The root of the matter – ensuring the sustainable use of agricultural soil

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ABSTRACT

The unsustainable use of agricultural soil results in negative biophysical and socioeconomic impacts, compromising not only food production, but the recycling of fresh water, the fluxes of greenhouse gases, biodiversity, cultural heritage, landscape, and the health and living conditions of communities. This study screens the existing policy and shows that there is a significant body of legislation related to agricultural soil, from which two main policies can be identified: the National Program Against Desertification and the Common Agricultural Policy. The targets and indicators of these policies are reviewed, with the aim of understanding their ability to ensure the sustainable use of agricultural soil. The study also analyzes two case studies of agricultural areas and collects testimonies from farm managers, seeking to identify the drivers for sustainable use of the soil. These are followed by the analysis of different policy options, considering their feasibility and ability to integrate the spectrum of issues related to agricultural soil. Finally, we propose the development of a National Strategy for Agriculture which would provide an overarching instrument, integrating all the targets related to agriculture and that would be translated in measures supported by a defined financing instrument. The Common Agricultural Policy is proposed as the existing instrument that would be able to fully support the implementation of the strategy. The study also presents recommendations for the implementation of the policy option.

Keywords: Soil, Desertification, Common Agricultural Policy, National Strategy for Agriculture.

JEL classification: Q18.

RESUMO

O uso insustentável do solo agrícola tem impactos biofísicos e socioeconómicos negativos, comprometendo não só a produção de alimentos, mas também o ciclo de água doce, os fluxos de gases de efeito estufa, a biodiversidade, o património cultural e paisagístico e as condições de saúde e vida das comunidades. Este estudo mostra que existe um significativo conjunto legislativo relacionado com o solo agrícola, do qual se podem destacar duas políticas principais: o Programa de Combate à Desertificação e a Política Agrícola Comum. Este estudo analisa as metas e indicadores destas políticas, de forma a avaliar o seu contributo para assegurar o uso sustentável do solo agrícola. O presente trabalho analisa ainda dois casos de estudo de áreas agrícolas e reúne depoimentos de agricultores com o objetivo de identificar motivações para o uso sustentável do solo. Em seguida são analisadas diferentes opções políticas tendo em conta a sua viabilidade de implementação, bem como a integração do abrangente leque de questões relacionadas com o solo agrícola. Por fim é proposta a criação de uma Estratégia Nacional para a Agricultura, um instrumento abrangente que integre todas as metas relacionadas com a agricultura e que se traduziria em medidas apoiadas num instrumento de financiamento adequado. A Política Agrícola Comum, mecanismo de apoio à agricultura com um orçamento associado, é proposta como o instrumento de

implementação da estratégia. O estudo apresenta ainda recomendações para a implementação desta opção política.

Palavras-chave: Solo, desertificação, Política Agrícola Comum, Estratégia Nacional para a Agricultura.

Classificação JEL: Q18.

1. WHY IS SOIL THE ROOT OF THE MATTER?

This study started from an open discussion in the Portuguese society - agricultural areas are pointed out by the media, communities, civil society groups, and researchers as a threat with impacts on public health, soil degradation, destruction of the archaeological patrimony, among other issues. But what can actually be blamed as the source of these impacts? The development of irrigated farming in parts of the country? The increasing domination of monoculture? The intensive agricultural systems? It is difficult to identify one of these issues as the single cause of the impacts that are causing public indignation, as none of them can by itself be accounted for the range of negative impacts.

Soil supports a multitude of processes and resources, which can be grouped according to the following (as adapted from Weil and Bradley (2017)):

- Provision of food, feed, fibres, wood, clean water, among other important resources;
- Regulation of the water, nutrients, and greenhouse gas cycles;
- Environment for recreation, spiritual uplift, and cultural landscapes and heritage;
- Support of terrestrial biodiversity, human settlements, geological and archaeological archive.

These are often referred as the soil ecosystem functions and services, a concept which is useful for expressing the value of natural resources to human societies and that can help bringing the knowledge from soil science to policy design and decision making (Glæsner et al., 2014). The broad set of functions and services provided by the soil evidences its relation to very different aspects of society. If the soil is used in an unsustainable manner it can result in health problems related to the quality of water, in the loss of biodiversity, or in the loss of cultural patrimony such as landscapes that characterize some rural areas. As expressed by Pinto Correia (2020), “Soils have often an under recognized role, but if soils are ill-functioning the societies will be ill-functioning: there will be floods, lack of food and clean water, political instability, etc. “.

Despite its importance, soil in Portugal is used without ensuring that its vital functions are maintained. Soil itself is being degraded faster than it is formed, mainly because of soil erosion. The average soil loss in Portugal is estimated to be above the average for the EU, and both are well above the soil formation rate, as shown in Figure 1 (Panagos et al., 2015). Extreme soil degradation can lead to desertification, which should not be confused with depopulation, being defined a gradual process of soil productivity loss and the thinning out of the vegetative cover because of human activities and climatic variations such as prolonged droughts and floods. What is alarming is that though the land's topsoil, if mistreated, can be blown and washed away in a few seasons, it takes centuries to build up (UNCCD, n.d.). Desertification results in dramatic environmental, social, and economic impacts. According to evaluation presented in the National Action Program Against Desertification (RCM nº48/2014), the area in Portugal risking desertification has been increasing steadily during the last decades and is currently estimated to represent 63% of the territory, as shown in Figure 2.

The awareness about the importance of soil conservation has been rising in more recent years: the United Nations instituted the World Soil Day since 2015 (it's celebrated in the 5th of December) and the European Union the research and innovation agenda has been increasing the focus and budget on soil research. The European Union program for research and innovation for the years 2021-2024, Horizon Europe, aims at finding solutions to five big societal challenges, and has identified soil health as one of these challenges. Despite its importance and increasing awareness, the European Union (EU) lacks a policy focusing on soil conservation, as it exists for other vital resources, such as the Water Framework Directive and the Air Quality Framework Directive. In 2018 the European Court of Auditors published a special report concluding that, while desertification and land degradation are growing threats in the EU, there is no vision to combat desertification. The European Commission and the Member States collect data about different factors with an impact on desertification and land degradation, but there is no conclusive assessment of this data and there is no common methodology for doing it (European Court of Auditors, 2018). There are several EU policies with

implications on the use of agricultural soil, such as the Common Agricultural Policy, the Strategy on Adaptation to Climate Change, and the Water Framework Directive, but there is a clear lack of integration of these policies towards a sustainable use of soil (European Court of Auditors, 2018; Farmer, A., 2020).

2. SCOPE OF THIS POLICY STUDY

The soil's functions are vital in urban, industrial, and rural areas. Because the problems that motivated this study arise from agricultural systems, it focuses on the use of agricultural soil. This study intends to answer the following questions:

- Do current policies ensure the sustainable use of agricultural soil?
- Which policy options could be considered for improving the sustainable use of agricultural soil and how could they be implemented?

To answer these questions, the study builds on the following methodology:

- Collecting evidences of the multiple impacts of agricultural soil use;
- Analysis of the current policies related to the use of agricultural soil and evaluation of the policy targets and indicators of their effectiveness ;
- Mapping of the incentives for sustainable use of the soils from the farmers' perspective, by interviewing farm managers and representatives, as a way to analyze the different policy options.

3. AGRICULTURAL SOIL USE IN PORTUGAL

3.1. Brief lessons from the past

There are examples of past policies which resulted in unsustainable use of agricultural soil and left significant marks in the Portuguese territory. Such an example are the policies known as "wheat campaigns", implemented during the first half of the XX century. The "wheat campaigns" are often recalled by practitioners and researchers by their large scale and prevailing negative impacts. The wheat campaigns were aimed at increasing the cereal production, mainly in the southern region of Alentejo. This semi-arid region was dominated by an agro-silvo-pastoral land use system, which consists of a mix of forest (composed by sparse cork trees, or other well adapted *Quercus* species, olive trees and shrubs), annual crops grown beneath the trees, and livestock that grazes on the tree fruits, stubble or cultivated pastures. In such system, the soil nutrients were cyclically replaced by the shrubs, trees, and animal manure, and long fallow periods. But the wheat campaign had dramatic results with loss of soil fertility, due to the insufficient replacement of the nutrients taken up by cereals and to the increased soil erosion resulting from excessive soil mobilization. Today, many territories are still discussing how to cope with the impacts of the wheat campaign, with desertified areas where the soil layer became too thin and poor for agricultural production (European Commission, 1999).

3.2. Current concerns related to agricultural soil use

The present study arose from a series of current concerns related to the use of agricultural soil. Recently, the media, civil society movements and research community alerted on impacts related to the use of agricultural soil. These impacts can be grouped in five categories:

- Biodiversity loss (namely loss of habitats such as agricultural steppes, decline of pollinators, and decline in endemic and endangered species).
- Loss of archaeological and cultural patrimony (namely, destruction of pre-historic remains; loss of characteristic rural landscapes).
- Human health (namely agrochemical applications near houses and settlements and air pollution from agro-industry).

- Soil degradation and productivity loss (namely soil erosion, salinisation risk, and decline in organic matter).
- Labour conditions and human rights (namely displaced seasonal workers and illegal traffic of workers).

It should not come as a surprise that the current concerns emerging from the use of agricultural soil, coincide largely with the soil functions listed at the beginning of this study. These concerns arise mainly in relation to the development of intensive agriculture, which is changing the biophysical and socioeconomic landscapes of some rural areas. Agricultural intensification at a large scale has taken off in Portugal rather later than in other EU countries. Intensification in agriculture demands higher input of resources per unit area. As a result, the intensification of large areas requires adequate management and guidelines, including the relation to the other land uses such as the urban (houses and locations). This can imply higher standards for the use of agrochemicals, the treatment and processing of the agricultural and agro-industrial residues, and the well-being and living conditions of the associated labour force, with often is composed of migrating workers, whose homes are not in the region.

Two intensification examples are discussed, both located in the southern region of Alentejo. One example is on the southwest coast with mainly herbaceous cropping systems, often using greenhouses and producing small berries. The other example is located on the interior and is characterized by very high-density orchards. The following sections identify key issues within these two cases, to support the search for suitable solutions.

3.3. Agriculture soil use and management in south interior of Alentejo (Alqueva irrigation)

A large part of the Portuguese territory is a dryland with a Mediterranean climate with hot summers. As a result, the plants suffer from water stress during part of the growing season. Water reservoirs and public irrigation infrastructures for distributing the water have been build, particularly in the southern part of the country to increase agricultural productivity. The total area irrigated with publicly managed irrigation infrastructure in Portugal, has increased by almost a 3-fold in the last decade, as shown in Figure 3. Over 30% of this area corresponds to the area irrigated with water from the Alqueva reservoir, in the interior of south Alentejo, which irrigates an area over 100.000 ha. The idea of a large water reservoir for agricultural irrigation in Alqueva exists since the 1950s, but it was only in 2002 that the gates of the dam were finally closed and the reservoir reached the full level in 2010, resulting in the largest artificial lake in Europe. As the price of water is rather high, farmers choose to install permanent cultures (mainly olives and almonds) which consume less water than annual crops and use high efficiency irrigation systems (drip irrigation).

The water availability allowed for the development of high-density systems, in which the trees are limited to the size of shrubs and grow in dense continuous lines that resemble vineyards. An advantage of this system is that it enables the fully mechanization of the farming operations. As a means of comparison, the highly intensive systems have over 1000 trees per hectare, while the extensive olive orchards have between 100 and 300 trees per hectare. Such high density of trees is only possible due to irrigation, but it is also demands higher fertilization and requires adequate management in order to conserve the soil functions. The intensification leads to higher productivity per area, but it also requires high mechanization, which is only economically feasible for larger farms. As a result, in order to be able to set up a profitable farm within the irrigated area, it is necessary to have access to large areas of land and to have the capacity to invest in machinery for the mechanization. For this reason, the changes to more intensive production systems are also accompanied by changes in the ownership. According to journalistic investigation published in January 2020, 45% of the olive orchards in the irrigated area of Alqueva is managed by three companies, while six companies manage about 65.5% of the total area (Barriga, 2020).

3.4. Agriculture soil use and management in the south Alentejo coast (Mira irrigation district)

The Mira irrigation district in the southwest coast of Portugal, consists of a network for water distribution from a surface reservoir in the river Mira to an agricultural area with a potential of 12.000 ha. This infrastructure was constructed between 1963 and 1973. Until 1975, Portugal had a dictatorial government under which the conservation of natural patrimony was not a priority. It was only under the democratic system that the rich biodiversity of the southwest coast was

systematically identified and a natural park was designated in 1988. The area of the natural park includes the Mira irrigation district. The area is also part of the Natura 2000 Network, classified according to the EU Birds and Habitats Directives. Initially, there was an agreement that the agricultural uses would be compatible with the conservation of the unique natural values. The conflicts between agriculture and nature protection have been managed with more or less success, but recently, the expansion of the agricultural area and the intensification of the farming systems is threatening the initial ideal of compatibility between the two uses, according to civil movement groups and researchers. Other important issues were also pointed out by public environmental inspection body in evaluation reports showing that the plan for the agricultural area, which included monitoring of the resources such as soil and water is not being implemented and the obligatory monitoring of these resources is not being made (IGAMAOT, 2017). Furthermore, the production of small berries and vegetables has high labour demands, which is fulfilled almost entirely by migrating workers, many from Asiatic countries, which live displaced in the area, often with bad living conditions regarding housing or access to public services.

4. WHICH POLICIES TO PROTECT OUR SOIL?

There is a large body of policies and regulations related to agricultural soil, some of which are listed in Annex A. Part of the legislation consists of regulations and guidelines, such as for the application of sewage sludge to agricultural soils, the use of nitrate fertilizer, pesticides, among others. As mentioned in the first section, there is no legislation at the EU level focusing on soil, and this is also true at the national level. Even though, there are two policies with a potentially large impact on the use of agricultural soil: the National Action Program Against Desertification and the Common Agricultural Policy. In the next sections we analyze the measures related to agricultural soil use within these policies and analyze the indicators of their effectiveness.

4.1. The National Action Program Against Desertification

Portugal joined the United Nations Convention to Combat Desertification in 1994. Consequently, the country had to develop a National Program Against Desertification, the first of which was approved in 1999 and revised in 2014. The Program focus on four strategic objectives: 1) improve the living conditions of the affected populations; 2) improve the conditions of the affected ecosystems; 3) generate global benefits from the effective implementation the convention; 4) mobilize resources to support implementation of convention in building effective partnerships between national and international actors.

Even though soil degradation is the cause of desertification, soil conservation is just one among twenty specific objectives (which include objectives such as valorise the land, promote economic diversification, etc). Furthermore, concerning the specific objective of soil conservation, the program does not include quantitative targets. One of the considered targets is the creation of a “national monitoring system of the soil quality and the organization of databases with relevant information”. The indicators for monitoring are also unclear. There are two quantitative indicators that can indirectly refer to the soil: “land use change per decade” and “territory under sustainable management”, but the units, the expected impacts, and the changes that could be considered “sustainable management”, are absent. Another indicator is the “existence of soil cartography”, which is very vague as an indicator of implementation.

In 2019 the National Accounting Court published an evaluation of the National Action Program Against Desertification. The evaluation states that the program lacks actual implementation and fails in all strategic objectives because it does not clearly define the actions, entities, timeline, and budget for the policy measures (Tribunal de Contas, 2019).

4.2. The Common Agricultural Policy

Agriculture is an area where the EU and the member states have shared competence. The Common Agriculture Policy (CAP) is one of the oldest EU policies (it first started in 1962) and currently accounts of almost 40% of the EU budget. It is likely that CAP is the policy with largest influence in agricultural soil use in the Member States. The CAP started as an policy to increase food production in post-war Europe, but as the challenges kept changing, the policy was been periodically revised and started to include sustainability objectives since the last four decades. The CAP can be described by

two main pillars of incentives: the first pillar is often named “direct payments” and is directed to all farmers that, the second pillar is composed by the “Rural Development Programs” aimed at financing projects or measures with specific objectives towards sustainability and rural development, consisting of voluntary measures for additional support.

The first pillar introduced in 2005 the “good agronomic and environmental conditions” (GAEC) measures. These are measures that all farms have to comply with, in order to receive financial support. The Member States have some flexibility choosing the GAEC measures more appropriate to their conditions. The GAEC measures relevant to sustainable use of the soil in Portugal are:

- Keep the soil covered with a cultivated crop, spontaneous vegetation or residues between 15th November and 1st March.
- Minimize the soil mobilization, according to the slope of the land.
- Maintain the landscape elements (terraces, riparian galleries, groves, and trees classified with public interest).

These GAEC measures are important to decrease the rate of soil erosion (soil loss), which is a significant problem, as shown in Figure 1. A study by the European Joint Research Centre concludes that the soil erosion rate in the EU and in Portugal has reduced as a consequence of the GAEC measures. For Portugal it was estimated a reduction in the erosion of about 18% in arable land between 2012 and 2000 (Panagos et al., 2015). This is a very significant impact but this estimate has to be carefully analysed. The study assumes that no conservation measures were in place prior to the GAEC and that these resulted in an improvement, but no actual measurements or observations were carried out to verify these assumptions. At a national level, there is no published evaluation of the effectiveness of the GAEC measures. The GAEC are also a missed opportunity to implement more ambitious measures for sustainable land use that are transversal to all the farmers, because some of them (in total they are 7) include measures that were already enforced by other pieces of legislation. Those are the cases of the limitations to burning of residues and the authorizations for water use.

The first pillar also includes the so called “greening” measures. These are measures that some types of farms have to follow in order to receive the total amount of direct payments. “Greening” measures are termed as obligatory, but farmers would still receive part of the direct payments even if not applying these measures. The legislation also mentions “sanctions” but there is no official information regarding the application of sanctions to farms not complying with greening measures. In brief, the measures include:

- Crop diversification (for farms > 10 ha);
- Maintenance of the areas with permanent pastures;
- Farms with more than 15 ha must keep 5% of the area for ecological purposes (includes fallow land, landscape elements as accounted for GAEC, and legume crops).

The “greening” measures can provide beneficial outputs for sustainable soil use, but could aim for a less limited scope of application. Given the minimum sizes of farms and a number of cases that are excepted from the measures, a large farming area doesn’t actually need to do anything extra to receive the “Greening” incentive. The numbers collected by the Eurostat show that in Portugal, only 31% of the area, corresponding to 3% of the farms, is subject to the application of the crop diversification measures, according to 2018 data. This value is the third lowest value among the Member States, for which the average is 74% (European Commission, n.d.). This also shows the need for criteria better adapted to the different countries, so that the measures can actually deliver the policy goals.

The second pillar of the CAP is comprised of voluntary measures under the Rural Development Programs. In Portugal, these include measures for the “prevention of erosion and improvement of soil management”, which are:

- direct seeding or limited soil disturbance in between the lines of the crops;
- keep the soil covered in between the lines of permanent cultures.

The Rural Development Program evaluation report of 2019 indicates that both measures achieved high interest from farmers (above 100% of the estimated budget in 31/12/2018), as well as a rather high execution (81% and 95%, respectively). The percentage of farm land that had contracts for soil conservation was 32%. The report indicates that this value surpassed the estimated maximum potential of the program, and is therefore considered positive in the evaluation of the policy. Although, there is a lack of evidence about its positive impact, because there is no actual monitoring of the effects of the measures on the soil. The evaluation report clearly states the need for a “monitoring plan for evaluation of the organic matter in the farming areas, as a proxy for improvement of the soil health” (Marta-Pedroso, C., 2019). The scientific community has also raised concerns regarding the fact that the CAP measures are not able to fulfil the sustainability challenges, with respect to biodiversity, climate, soil, land degradation as well as socio-economic challenges, due to the low impact of some of the considered measures (Pe’er et al. 2020; Pe’er et al., 2019; Recanati et al., 2019).

4.3. Other policies related to the use of agricultural soil

Another of the policies listed in Annex I is a program that could be relevant to the use of agricultural soil, the National Irrigation Program. In fact, the National Irrigation Program identifies as strategic objectives “the sustainability of water and soil” and the “respect for environmental values”. Specifically on soil, the program states: “Promoting good agricultural practices, as this irrigation infrastructure allows, preserves the soil and counters desertification. This improvement in soil quality is evidenced by the increase in the content of organic matter, water and nutrient retention capacity, which favours the growth and vitality of plants and vegetation in general. Moreover, soil organic matter is a determining component for the performance of the environmental and ecological functions, such as fertility, or carbon sequestration and controls hydrological and biodiversity, with positive effects plant health of crops.” This is a very general remark about the importance of organic matter in soil, but there is no indication of which “good agricultural practices” will be promoted. There is also no indication about how the expected soil improvement resulting from the implementation of the National Irrigation Plan will be evaluated. Furthermore, the program totally omits any of the risks of soil degradation that can arise the production systems, such as salinisation and increased erosion. The program lists the investment in different infrastructures in the country, partly with origin in the Rural Development Program. It uses the conservation of soil and water as a justification, but does not provide clear targets or a plan for its evaluation.

4.4. What drives farmers towards sustainable soil use?

This study initiated by showing how soil was vital for our society. When it concerns agricultural soil, farmers may represent the straighter link with this resource. Because farmers make their living from the agricultural production, the sustainability of the resources is the sustainability of the business. During the second half of the XX century there was a rapid development of agrochemicals, new crops and technology. These developments almost led us to believe in a total control over the natural resources. Modern farmers became aware of the relations between their practices and the environment and also about the positive feedback of a healthy environment on their activity. Ultimately, the farmers are essential guarantors of the health of agricultural soil and therefore it is important to understand which drivers can strength that role.

This study collected the testimonies of several farmers regarding the possible drivers for sustainable soil use. The testimonies were collected from farms with agricultural production aimed for commercial purposes, from different parts of the country (Douro, Ribatejo, and Alentejo). The spokespersons were either the farm owners or technical managers. Because one goal was to identify specific drivers towards sustainable soil use we were keen to particularly include farms that are known for such approaches.

It was clear that legislation is a transversal driver for sustainable soil use, as all the farms are keen to state that they follow legislation thoroughly, even if some of its aspects were frequently pointed-out as “limiting”. The farmers also indicate that the voluntary measures under the CAP are very important for the producers that seek a more sustainable use of soil because they constitute an immediate reward for those efforts. The farmers that claim to apply practices that go beyond the CAP voluntary measures for soil conservation (and other environmental measures in CAP) indicate that those practices are import for the sustainability of the resources of the farm (mainly soil). Some farmers also point out the relation between good environmental conditions at the farm and the

quality of the products or the benefit of the activity itself. As examples, farmers named the existence of areas-rich in biodiversity as being beneficial for pest control, pollination, and agro-tourism, and soil health as fundamental for the character of the wines. Some farmers also mentioned the importance of consumers' perception. In this case farmers name the importance of being known for high standards towards environmental protection and also protection of other values such as cultural patrimony or community livelihood.

When relating these drivers according to the characteristics of the farms, it is possible to identify that the farms with drivers that beyond the regulations and the voluntary financial incentives, are those which management/ownership has a particular relation to the land and therefore seek the sustainability of the business (e.g. historical properties, sense of community belonging, environmental convictions) or those with an associated product or trademark (e.g. estate bottled wine and olive oil, fruits with high value, agro-tourism). Although, it is important to keep in mind that these characteristics are not sufficient conditions for the implementation sustainable practices.

On the other hand, some of the larger farms do not produce agricultural products that are sold under an own brand or for consumers that are aware of the product's origin. Much of the olives produced in the south of Portugal are transformed into olive oil that is exported and sold under Spanish and Italian brands. The farms which export their production declared their concern with complying with the legislation, but this might be the only driver for sustainable practices. It has been argued that, for some farm owners composed by large investment groups, the land is seen as a "financial asset" and profitability is priority over long term sustainability of the business (Barriga, 2020).

5. DO CURRENT POLICIES ENSURE SUSTAINABLE SOIL USE?

The analysis of the most influent policies and of the farmers' drivers, shows that the current policies do not tackle the challenges of sustainable agricultural soil use. Some of the obligatory measures apply to only a small part of farms, on the other hand only farms with particular characteristics apply measures that go beyond the obligatory legislation. Another important issue is that commitments made within the scope other policies have a low level of integration with the policies related to soil use. Examples of such commitments are:

- the land degradation neutrality by 2030, a goal committed in 2015 under the Agenda for Sustainable Development (Sustainable Development Goal Target 15.3).
- the decrease of greenhouse gas emissions from agriculture by 8% in 2020 and by 11% in 2030 in the National Climate Plan. The 2020 target will not be met as the last indicator showed a decrease of 3.7% in 2017. In the Carbon Neutrality Roadmap for 2050, soil is expected to have a large role as a carbon sink, which is highly dependent on how agricultural soil is used and managed.
- Preservation of the biodiversity in agricultural-based ecosystems, as foreseen in the Birds and Habitats Directive and the EU Biodiversity Strategy.

As a result, it becomes clear that policies, both the regulations and obligatory measures for economic support need to incorporate measures that can correspond to the level of the challenges of the sustainable use of agricultural soil, namely those that are already political commitments within other policy instruments.

6. WHICH ARE THE POLICY OPTIONS FOR ENSURING SUSTAINABLE USE OF AGRICULTURAL SOIL?

This section discusses different policy options for improving the sustainable use of agricultural soil. The presented policy options to be discussed arise from several elements presented the previous sections and are the following:

- I. Strengthen the current policies
- II. Soil Framework directive
- III. National Strategy for Agriculture

The analysis is based on the perspective that agricultural soil use has a wide range of impacts in society and therefore its sustainable use must be ensured. The discussion of the policy options considers the following criteria:

- level of integration of the multiple functions of agricultural soil;
- institutional constraints for implementation of the policy;
- overall feasibility (including political context, farmers acceptability and other relevant socioeconomic aspects).

Table 1 summarizes the discussion of the three criteria for the three policy options.

6.1. Strengthen the current policies

The current policies with main influence on agricultural soil use were analysed in section 3: the Program Against Desertification and the CAP. These policies can work as a complement, in which the Program Against Desertification acts as grounding policy with guidelines and targets for sustainable agricultural soil which integrate both biophysical and socioeconomic aspects related to agricultural soil, and the CAP as an support and incentive instrument for measures that lead to the targets. This complement is represented by the pyramid in see Figure 4, in which the Program Against Desertification is in the base and the CAP measures are constructed with basis on the defined guidelines and targets.

The Program Against Desertification has high potential for integration of the factors related to agricultural land use, because its includes biophysical and socioeconomic aspects in its strategic objectives, which are related to several of the impacts identified in this study. Although, it was shown that the Program lacked implementation as a result of unclear targets and indicators, unclear responsibility for the different measures, and lack of associated budget. The CAP obligatory measures (GAEC and Greening) may have some potential for sustainable soil use but constitute a missed opportunity for ensuring a more sustainable agricultural soil. As discussed in section 3, this was because part of the GAEC measures duplicates already existing regulation, and because the greening measures apply only to a small fraction of the farms and of the agricultural area. Furthermore, both the obligatory and voluntary CAP measures lack a monitoring system for evaluating their impact on the conservation of the soil functions.

Considering the institutional capability and feasibility, the CAP already has an established group of entities that design and process the incentives (Gabinete de Planeamento e Políticas (GPP), Instituto Financiamento da Agricultura e Pescas (IFAP)) and which can develop a revised version of the CAP, establishing links to other departments such as the institute responsible for nature conservation (ICNF) and the environment agency (APA), and implement a monitoring system by reinforcing their work teams. Regarding the Program Against Desertification, it needs that institutions have a well-defined role and also an associated budget. The feasibility of implementing the Program Against Desertification is mainly dependent on the capacity to define the necessary entities and budget. Considering the budget, one possibility would be to plan the use of the Rural Development Program with that goal.

6.2. Soil Framework Directive

In 2006, after a comprehensive stakeholder consultation, the European Commission presented a proposal for a European Soil Framework Directive. Similarly to the Water Framework Directive or the Air Quality Framework Directive, the proposal intended to tackle the several threats to soil conservation in an integrated manner. Several member states such as Germany, the Netherlands, and the UK, opposed the proposal, likely due to the cost of some of the foreseen measures. The proposal was discussed during several years, and it was finally abandoned in 2014. But the idea of a Soil Directive has not disappeared from the policy discussion in the EU and in Portugal. Researchers and non-governmental organizations have argued that a legislation focusing specifically on soil is the way to ensure that soil's functions are accessed in an integrated manner (Glæsner et al., 2014; Schutter et al., 2019).

Considering the institutional constrains, the implementation of a Soil Directive would likely need new institutional capabilities. This was the case of the implementation of the Water Framework Directive,

in which the Hydrographical Regional Councils that are responsible for the development of Regional Plans were created.

The option of a policy at the EU level has the benefits of a common framework for soil protection across the Member States. But even though, it's a cherished option by the scientific community, environmental organizations and some of the Member States, it would likely face the opposition of some countries. The proposal, negotiation and implementation would take a long time and need a very strong advocacy strategy. In the following years it might gain more support and eventually appear as a policy that is inevitable for the well being of citizens, as was the case for directives related to water and the air. At the moment, given the EU proposed under the Green New Deal, it might not be the straighter way to ensure sustainable soil use.

6.3. National Strategy for Agriculture

The idea of a National Strategy for Agriculture is to integrate all the commitments related to the use of agricultural soil in a national policy, which in Portugal, is comparable to the National Forest Strategy that sets out the country wide goals related to the forest areas. The National Strategy for Agriculture would indicate the goals related to agricultural soil but also to the food system, specify the instruments, and the source of the budget to be used for each of the goals. The Strategy aggregates goals made within the different policies such as the UN Sustainability Agenda, the Farm to Fork Strategy, the National Roadmap for Carbon Neutrality, the Biodiversity Strategy, the National Plan for Climate Change Adaptation, The Program Against Desertification. It is important to clearly define the relation between the measures proposed and the goals of the different policies, as well as the sources of the budget, because in this study we looked at examples of policies that don't reach their purposed due to lack of clear budget (Program Against Desertification) and other that has a clear budget but lacks coherence and clarity in its goals (The National Irrigation Plan).

This study showed that legislation is the driver common to all farmers towards sustainable soil use. As the CAP is already crucial instrument for the viability of farms, and it can be developed to include a broad scope of supported obligatory measures that are designed to guarantee that the quantified strategic goals are achieved. As it was also seen, some farms have specific drivers for sustainable soil use and these could reinforced and supported by the CAP voluntary measures, that would also be designed considering the defined goals and beyond, maintaining an innovative path towards sustainability. In this way, the National Strategy for Agriculture would be a unifying policy that would guide the design of the national CAP measures. The process for creating a National Strategy for Agriculture would have to include the range of public administration departments implementing policies with touching points with the Strategy for Agriculture. The pyramid of policies related to the use of agricultural soil would be represented as in Figure 5, in which policies such as the Program Against Desertification and others have their goals reflected in the Strategy. This option could therefore integrate all the issues related to agricultural soil use, make use of the existing institutions and capability. It also has the important advantage that the CAP has a designated budget that could be directed towards the implementation of the Strategy. This would imply precise design of the measures, within the flexibility that is given to the Member States. This process is as fundamental as complex, and it demands a broad consultation including the farmers, environmental organizations, and civil movements in order to guarantee that the measures are design towards the right goals. There can be opposition from farmers groups, because the support would be linked to higher demands, but it would ensure that farmers caring for sustainability of their businesses would be highly benefit from the re-design.

7. CONCLUSIONS AND RECOMMENDATIONS

Agricultural soil is a vital resource, providing a broad range of functions and services essential to society. Although, this resource is currently facing degradation and the indicators show that agricultural soils in Portugal are generally in poor health and face risk of desertification. This study shows that the use of the soil has a range of impacts as broad as its functions and services. Several of these issues have become visible because of the recent intensification of agriculture in Portugal. This demands a new strategy to deal with the sustainability challenges and the changing drivers of the farmers options. In the discussion of possible policy options, the study evidenced that the most suitable option was that of a strategy for integration of the issues related to sustainable agricultural use, most of which already exist within other policies, and which points out the processes and budget

for reaching these goals. Unlike other economical sectors, agriculture in Portugal doesn't follow a unified Strategy which could clearly point out the goals to be reached and integrate all the issues related to agriculture soil use. The CAP can be redesigned as the policy instrument for implementation of the Strategy, because it is a supporting instrument, with both obligatory and voluntary measures.

For the implementation of this option the following recommendations are given:

- The definition of the Strategy needs to involve a broad scope of public institutions and public officers working with the environment resources, agriculture, nature conservation, health and labour. It also needs to ensure the consultation from farmers and farmers associations, municipalities, civil society, non-governmental organizations, and the research community.
- The Strategy will mainly incorporate the goals related to agriculture that are in other policies, but it will only be a useful instrument if these goals and respective execution indicators and monitoring tools are clearly defined. The Strategy main focus is also the processes to fulfil the goals.
- The CAP, a prevailing instrument for financial support and incentives for farmers, with a strong associated budget, is redesigned in order to implement the goals defined in the Strategy for Agriculture.
- The redesign of the CAP is more complex than the Strategy itself and this process needs a broad consultation that ensures participation and inclusion of all the relevant stakeholders. It is important to create public awareness of the process, as it might face major resistance from some groups, most specially part of the farmers that are less willing for improving the sustainability of their activity.
- The Strategy must implement system for monitoring the soil health and the other goals defined in the Strategy. Such a system must be permanent and can be attributed to a consortium of entities which can include the public administration, public research institutes, and universities.
- The consortium is liable to present the monitoring results to an external, independent team that makes the evaluation report. The consortium also presents a recommendation report with a larger periodicity (3 to 5 years) in order to provide inputs for improvement of the policy measures.

ACKNOWLEDGEMENTS

The author would like to thank Catarina Grilo for envisioning and making LEAP possible, Tiago Domingues for his constant mentorship along this work and all the people that offered their time, knowledge, and experience during interviews for this work.

FUNDING

This work was possible due to a grant provided under LEAP - Policy Development Initiative by the Calouste Gulbenkian Foundation

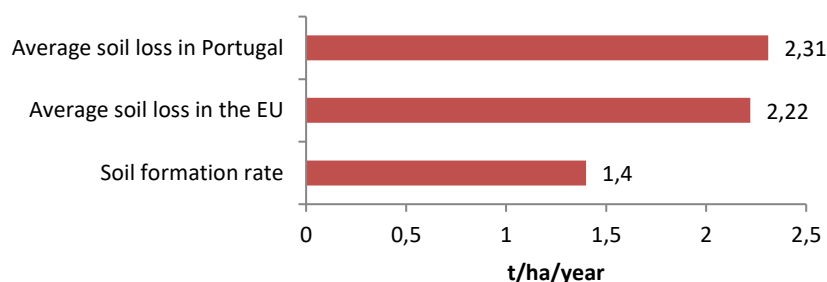
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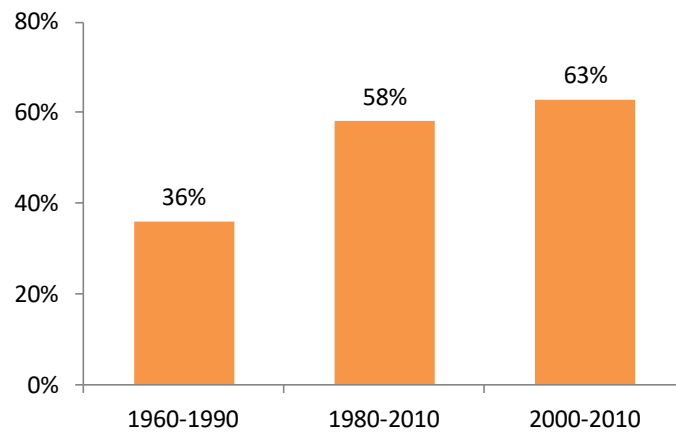
TABLES AND FIGURES

FIGURE 1: SOIL FORMATION RATE IN EUROPE AND AVERAGE SOIL LOSS IN PORTUGAL AND IN THE EU.



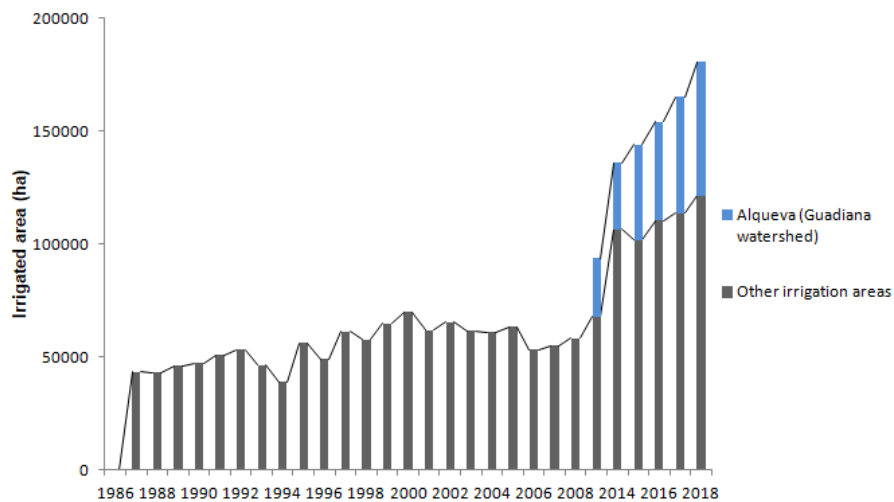
Source: Panagos et al. (2015).

FIGURE 2: AREA OF PORTUGAL SUSCEPTIBLE TO DESERTIFICATION, UNDER THREE DIFFERENT TIME PERIODS.



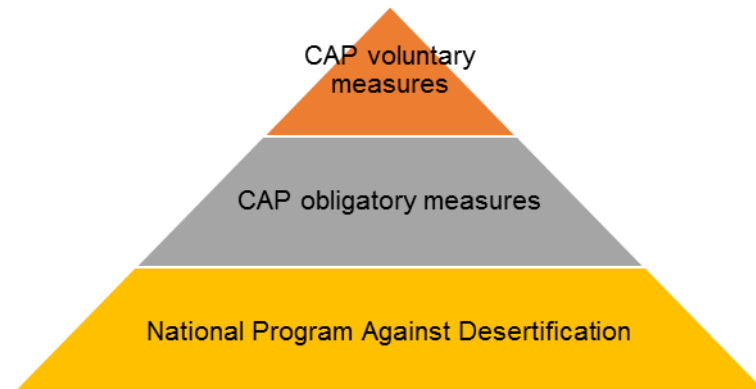
Source: adapted from RCM nº78/2014.

FIGURE 3: IRRIGATED AREA BY PUBLIC IRRIGATION INFRASTRUCTURES IN THE PERIOD 1086-2018 WITH AREA IRRIGATED BY ALQUEVA (CONSIDERING ONLY THE AREA IN GUADIANA WATERSHED).



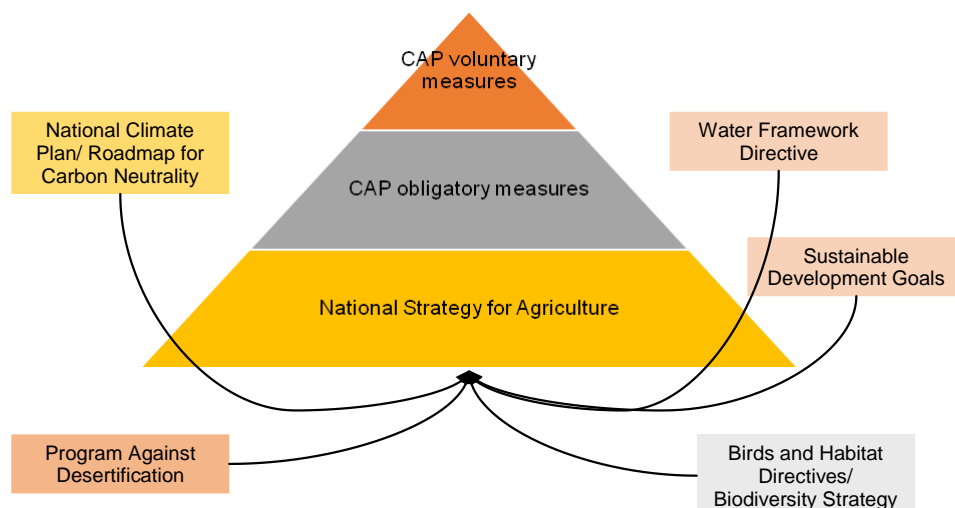
Source: (DGADR, 2019).

FIGURE 4: PYRAMID OF CURRENT POLICIES RELATED TO AGRICULTURAL SOIL USE.



Source: Author's elaboration.

FIGURE 5: CONFIGURATION OF THE POLICIES RELATED TO AGRICULTURAL SOIL USE WITH THE INITIATIVE OF A NATIONAL STRATEGY FOR AGRICULTURE.



Source: Author's elaboration.

TABLE 1: SUMMARY OF THE CRITERIA DISCUSSED FOR THE THREE POLICY OPTIONS.

Policy options	Level of integration of agricultural soil use issues	Institutional constrains	Overall feasibility
Current Policies	Can integrate several biophysical and socioeconomic issues if ground policy is implemented	Part of the policies have institutions and processes associated, although there are limitations in evaluating the results of the policies. The ground policy lacks institutional responsibility.	The budget for the implementation of the ground policy is missing.
Soil Framework Directive	Can integrate all issues regarding agricultural soil and other soil uses.	Member States may need to create new entities/departments for implementation.	Many States may be unsupportive of the proposal and block the process.
National Strategy for Agriculture	Can integrate all the issues related to agricultural soil use.	The present institutions could support the new policy architecture, with teams being reinforced.	CAP budget could be allocated to the well defined sustainability goals.

Source: Author's elaboration.

ANNEX 1: SUMMARY OF LEGISLATION RELATED TO AGRICULTURAL SOIL IN PORTUGAL

Policy name and legal identification	General objectives and targets related to soil
National Program Against Desertification (Resolution of Ministers Council n.º 78/2014)	Regarding the specific targets on soil conservation, there are no quantitative targets for soil conservation or improvement. The targets are: <ul style="list-style-type: none"> - Increase the area sustainably managed; - Produce a soil cartography; - Develop a soil monitoring system; - Revise the soil management good practices
Common Agriculture Policy (CAP) - Good Agricultural and Environmental Conditions (GAEC) (Normative Decree n.º 6/2015)	The cross-compliance mechanism introduced in 2005 basic measures that all farms have to comply with in order to receive CAP support, the GAEC. These include some basic measures for soil and biodiversity.
Common Agriculture Policy (CAP) - Greening measures	“Greening” measures are termed as obligatory, but farmers would still receive part of the direct payments even if not applying these measures. Includes 3 measures related to crop diversification, maintenance of permanent pastures and ecological areas.
Common Agriculture Policy (CAP) - Rural Development Program (Portaria n.º 50/2015)	The Rural Development Programme consists of measures to support farmers in regard to different strategic objectives. One of the priorities of the programme is <i>Prevention of erosion and improvement of soil management (P4C)</i> .
National Irrigation Program (Resolution of Ministers Council n.º 133/2018)	The plan includes as objectives: <ul style="list-style-type: none"> - sustainability of soil and water resources - respect for the environmental values. Desertification is identified as a risk and it is stated that irrigation <i>allows the adoption of good practices for soil conservation and consequent increase in soil organic matter and biodiversity</i> .
National Strategy for Organic Agriculture (Resolution of Minister’s Council 110/2017)	Sets a national target of 12% agricultural area under organic agriculture in 2027. Organic agriculture sets restriction to the use of synthetic agrochemicals applied without specific targets on other factors.
Directive concerning the protection of waters against pollution caused by nitrates from agricultural sources (91/676/EEC and 98/15/EC)	Limits inputs of nitrate fertilizers to soil.
Directive on the sustainable use of pesticides (2009/128/EC)	Reduce level of pesticides identified as most harmful for biodiversity.
Directive on sewage sludge used in agriculture (86/278/EEC)	Requirements of sludge for agricultural soil application.
Executive Order 626/2000) – Use of olive mil waste waters for irrigating agricultural soils	Standards for the application of olive mill waste waters on agricultural soils.



Food Production Vis-à-Vis Water Scarcity in Portugal – Using public policies to promote rainfed nut production

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ABSTRACT

Agricultural activity in Portugal is facing major challenges related to climate change and water scarcity events, as rainfall is affected by significant seasonality throughout most of the country, and access to water resources is vital to ensure the viability of the sector. Public policies have been targeting water storage and abstraction to foster irrigation for intensive farming, despite severe environmental impacts caused by dams and water overexploitation, bringing along the loss of habitats and biodiversity and landscape values, as well as a conspicuous decrease in the quality of water. Therefore, an alternative strategy is worth studying, to ensure food production while promoting environmental conservation. A critical analysis of current public policies is developed, and a new set of public policies is put forward through a comparison between alternative political options, using nut production as a case study, and considering its economic, societal, and environmental impacts while ensuring the recommended dietary intake of nuts.

Keywords: Climate change, freshwater management, habitat and biodiversity loss, intensive farming, nuts.

JEL classification: Q15, Q18.

RESUMO

A atividade agrícola em Portugal enfrenta grandes desafios relacionados com as alterações climáticas e eventos de escassez de água, dado que a precipitação é afetada por vincada sazonalidade na maior parte do país e o acesso a recursos hídricos é fundamental para garantir a viabilidade do sector. Deste modo, as políticas públicas têm estado orientadas para o armazenamento e captação de água, de forma a promover a irrigação para agricultura intensiva, apesar dos importantes impactos ambientais causados por barragens e sobre-exploração de água. Acarreta ainda perda de habitats e de biodiversidade, de valores paisagísticos, bem como uma diminuição considerável da qualidade da água. Assim, uma estratégia alternativa deve ser considerada, visando assegurar a produção de alimentos e a conservação ambiental. O trabalho desenvolve uma análise crítica das políticas públicas vigentes e propõe um novo conjunto de políticas, através do estudo comparativo entre opções políticas alternativas, tendo a produção de frutos secos como estudo de caso, considerando

seus impactos económicos, sociais e ambientais, e garantindo o seu provimento dietético recomendado.

Palavras-chave: Alterações climáticas, gestão dos recursos hídricos, perda de habitat e biodiversidade, agricultura intensiva, frutos secos

Classificação JEL: Q15, Q18.

1. INTRODUCTION

Water scarcity is a global issue of concern: estimates show that, by 2030, 47% of the world's population (UNESCO, 2017) and 11% of the European population (implying 17% of European territory) (Alcalde and Gawlik, 2014) will be affected by water stress. Also, more than 160% of the total water volume available in the world will be needed to satisfy the estimated global water requirements (Vo et al., 2014).

According to UNESCO (2017), two-thirds of the world population currently live in areas affected by water shortage at least one month a year, and approximately 500 million people live in areas where water consumption exceeds the locally renewable water resources by a factor of two. Also, estimates by the European Commission (2012) show that population growth and the competing needs of water users will result in an increase of global water demand of up to 60% by 2025, doubling by 2050 and bringing severe consequences for food security. Increasing water unavailability will negatively impact several economic and societal functions, including energy and food production (IPCC, 2014).

The increase in water consumption results from population growth, economic development, and dietary shift, which has been gradually oriented towards animal products. Also, while climate variability is the dominant factor influencing water scarcity on the shorter time scales (up to 6–10 years), socioeconomic development is the primary factor on longer time scales (Liu et al., 2017), i.e., trends driven by societal goals. This trend will be exacerbated due to water resources being used inefficiently in intensive agriculture (IPCC, 2019).

In Portugal, the current food production system, as in most of southern Europe, has severe negative environmental impacts on soil and, above all, water. It currently faces recurring over-use, and can lead to an overall scarcity in the future, significantly affecting especially the Guadiana river basin due to very intensive irrigation (EEA, 2020) in the Alqueva irrigation system as well as in the Algarve region (Pulido-Calvo et al., 2020).

Since current rate of self-sufficiency in food products is below 100%, there is an evident demand to feed a domestic population of nearly 10.3 million people, ensuring the qualitative and quantitative requirements related to food security and safety. Over the last years, the expansion of irrigated agriculture occurred associated to an intensification of olive and almond production (Silveira et al., 2018) aimed at increasing yields as well as exporting potential, putting into practice the comparative advantage theory set up by David Ricardo in the 19th century (Findlay, 1991), favouring the country's natural conditions to increase namely olive oil and almond production at a lower opportunity cost. This process was put in place by intensifying food production, namely in the Alqueva irrigation system, in Alentejo, in vast areas previously dedicated to extensive rainfed farming, reaching a total area of 120 000 ha while anticipating 50 000 ha more in the foreseeable future (EDIA, 2020a). As is the standard process elsewhere, the expansion of intensive agriculture over previous natural grassland is based on several characteristics: widespread use of pesticides and fertilisers, despite existing differences between crops; simplification of types of crops; mechanisation; development of a 'Fordist' type of production;¹⁴⁰ orientation towards global markets and long supply chains (Van der Ploeg, 2016).

Official communication also highlights an overall water shortage due to climate change as an obligation to increase water retention infrastructures.

All in all, this process of agricultural intensification may lead to cumulative negative environmental externalities which are often neglected.

¹⁴⁰ Involving “rising productivity based on economies of scale in mass production, rising incomes linked to productivity, [...] increased profits based on full utilization of capacity, increased investment in improved mass production equipment and techniques, and a further rise in productivity” (Jessop et al., 1992).

While providing abundant food supply and lowering prices for the consumer, irrigated agriculture brings along several negative impacts that should be addressed by the Government, public officials, and society at large. In Alentejo, the food production system based on irrigation is responsible for destroying habitats and biodiversity loss and overusing water resources (Silveira et al., 2018), though allowing to cope with desertification. Also, it still appears it does not guarantee adequate food security and sovereignty in essential goods, like legumes, fruits, and cereals (not considering rice) (INE, 2020a), as well as not guaranteeing access to an adequate universal dietary provision, nor favourable employment conditions for local communities living in rural areas. Small farmers do not feel included in these policies and claim state support to ensure better pricing on production factors and access to markets, against what is perceived as installed supply chains that crush revenues on behalf of big food production and distribution companies (CNA, 2019).

Alternative food production systems, such as extensive agriculture, regenerative agriculture, agroecology, and agroforestry, based on non-water-intensive methods, are failing to provide sufficient food to society due to low productivity. Despite the EU's Common Agricultural Policy (CAP) having increasingly included agro-environmental measures focused on incrementing biodiversity, habitat conservation, and rural development, it visibly lacks a large-scale, holistic approach. Adding to this, since environmental impacts originated by food production represent 20-30% of total anthropogenic environmental pressures in the European Union, mainly due to meat and meat products as well as dairy products (Tukker et al. 2006), and the agricultural sector is the largest consumer of water in Portugal, with more than 70% (APA, 2016; FAO, 2021), it is of major importance to redirect it towards a more sustainable system (Cardoso et al., 2017). Thus, some different main paths are currently predominant for the achievement of a more sustainable food production: restraining the demand for food with more adverse impacts; environmentally sustainable intensification of farming methods; or upgrading the food system, the latter calling for a structural change to food production and consumption (Garnett, 2014). As for demand restraint, some signals have already been put in place for awareness-raising purposes.¹⁴¹

Public policies should aim to provide inputs that effectively foster an adequate food provision, guaranteeing food quality, affordable prices for the consumers, environmental protection, enhancement of landscape values, creation of jobs in rural areas, and economic return for farmers who practice sustainable food production practices. Since some of the main arguments on the promotion of irrigation envisage food security/sovereignty, job creation, and habitat conservation, this article will consider a change in public policies focused on rainfed farming to achieve these goals. The current expansion of nut production through intensive almond production and its impact will be taken as a case study. Promoting alternative farming methods based on traditional extensive agriculture will thus be put forward, taking as a case study the national capability of nut provision to ensure the recommended daily intake of 30 g per capita as a contribution for a healthy diet (Ros, 2010) as well as economic viability, even though the political feasibility of this proposal may be debatable. Nowadays, even though chestnut, almond, and pine nut production through extensive farming are locally relevant in specific areas of the country, like the Trás-os-Montes and Alentejo regions, intensive almond production is significantly expanding. This is mainly due to public investment in irrigation infrastructure – where it is highly profitable – to target international markets (RCM, 2018) following rising demand for almonds as raw material for products as diverse as almond milk and cosmetics production (GVR, 2019; Wood, 2021).

In 2016, the potential daily provision of nuts per capita was at 6.6 g (INE, 2017), decreasing from 10.7 g in 2008 (INE, 2014). It should be noted that this decline is mainly justified by the reduction in the availability of chestnuts for consumption as a result of rising exports (INE, 2017). This output was supported by a 40 000-tonne yield, increasing to nearly 61 000 tonnes in 2018 and consisting of the production of four main crops: almond (36%), hazelnut (0.4%), chestnut (56%), and walnut (8%) (INE, 2018). Additionally, there is a definite potential to increment nut production for human consumption in the montado areas of the Portuguese continental territory, which is a traditional agro-pastoral system in the Southern Iberian Peninsula occupying around 1.2 million hectares (1/3 of Portuguese forested land) in Portugal (Sousa Uva et al., 2019) and is characterised by a mosaic of different land-use types ensured by the multi-functionality of typical agricultural practices, with cork and holm oak acorns. Still, nut provision is not being reached by typical households due to the average Portuguese population's low purchasing power, redirecting almond and chestnut production towards

¹⁴¹ *E.g.*, by the Minister of the Environment, who supported the elimination of beef in the canteens of the University of Coimbra (Lusa, 2019).

international markets. In contrast, acorn production is considered a sub-product with interest limited to livestock feed, namely the highly valued Iberian pig. Therefore, it can be stated that Portugal's food production does not currently reflect a sufficient dietary provision of nuts accessible to most of the population since there is no strategy put in place to achieve this goal.

This article analyses current food production public policies aimed at adaptation to climate change and water scarcity phenomena, namely CAP, and projected water storage and abstraction infrastructures under the National Irrigation Strategy 2014-2020 (DGADR, 2014) and similar projects, currently ongoing, in the face of present climate and ecological characteristics in the Portuguese mainland. A new set of public policies is then proposed by the authors, considering economic, societal, and environmental goals to be achieved, comparing two options: the first is an adaptation of the Swiss example of Ecological Compensation Areas, and the second is a more pronounced change in Governmental policies, targeting the promotion of extensive nut farming.

1.1. Current context of rural development and food production policies

Current national public policies focus on the EU's orientation towards protection against volatility in agricultural prices and food security provision through direct payments to farmers as envisaged by the CAP. At the same time, the recent Farm to Fork Strategy, under the European Green Deal, aims to reward the food chain stakeholders "who have already undergone the transition to sustainable practices" (European Commission, 2020a). The CAP "encompasses joint market frameworks ('first pillar') and the development of rural areas ('second pillar')" (Sterly et al., 2018). In Portugal, even though the second pillar is oriented towards sustainable management of natural resources, halting climate change, and achieving a balanced territorial development of rural economies and communities, the main driver has been the promotion of intensive access to water through the Government's Rural Development Program 2020 (PDR2020), with an expected investment in shared infrastructures related with irrigation of nearly 642 million euros, while environmental measures¹⁴² will be funded by a 179 million euros investment (MAFDR, 2019), thus constituting the principal financing mechanism to the expansion of irrigation, therefore, enhancement of agricultural production. Implementing new irrigation systems includes dam construction, despite the impact of dams on riverine ecosystems, natural habitats, and the sediment cycle.

Currently, the export potential of irrigated agriculture, namely oil, fat, and fruit production, is viewed as fundamental for the equilibrium of the national trade balance (INE, 2019), promoting corporate producers in detriment to regional food production, since the former "have greater capacity to prepare applications and meet complex subsidy requirements than smaller or traditional producers" (Silveira et al., 2018). These authors also note that, in the Alqueva irrigation system, "the cost of Irrigation Conservation Fees is a significant driver for smaller farmers to sell to private investors/companies interested in large-scale intensive farming". In Portugal, being subject to the variability of a Mediterranean climate, dependency on water use and water resources constitutes the most decisive factor for the viability of farms, which means that irrigation plays a significant role and is commonly considered a source of conflict. Several other impacts also have their origin in irrigated agriculture:

- Pollution of inland waters due to extensive use of fertilisers, leading to eutrophication
- Loss of biodiversity and natural habitats, as well as landscape and cultural values
- Dam construction and creation of water reservoirs, hampering the fluvial sediment transport and leading to siltation
- Intensive use of water resources

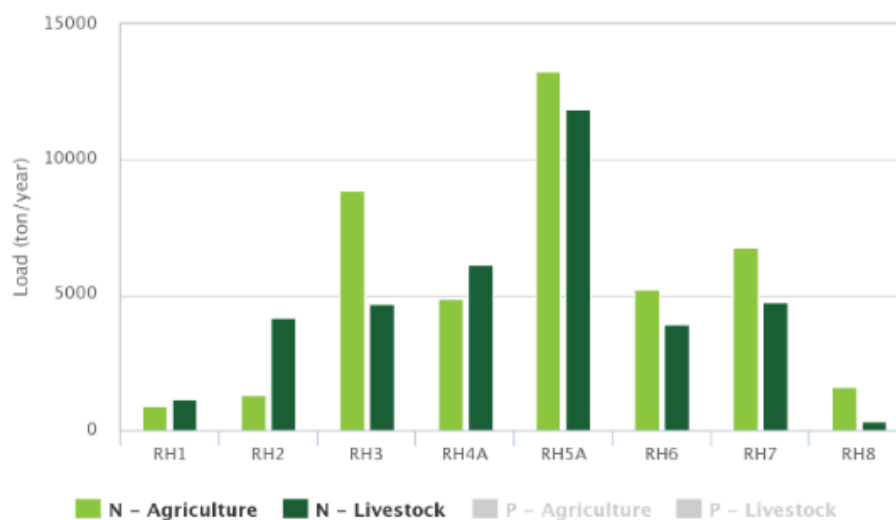
Irrigated agriculture is also dependent on a wide use of fertilisers, mainly nitrogen and phosphorus, which tend to drain to surface waters and groundwaters, leading to substantive eutrophication of water bodies (Ongley, 1996). However, technological breakthroughs enable well-designed irrigation systems to increase fertiliser efficiency (Wiesman, 2009). Diffuse pollution by fertilisers is one of the biggest causes of water pollution in Portugal (APA, 2019), jeopardising water quality. Excessive use of fertilisers also favours the growth of invasive species in water bodies to the detriment of native

¹⁴² Considering promotion of Natura 2000 areas, extensive grazing systems, agro-forestry diversification, and forest-environmental commitments.

species, leading to biodiversity loss and overburden water treatment plants, triggering further expenses and energy demand.

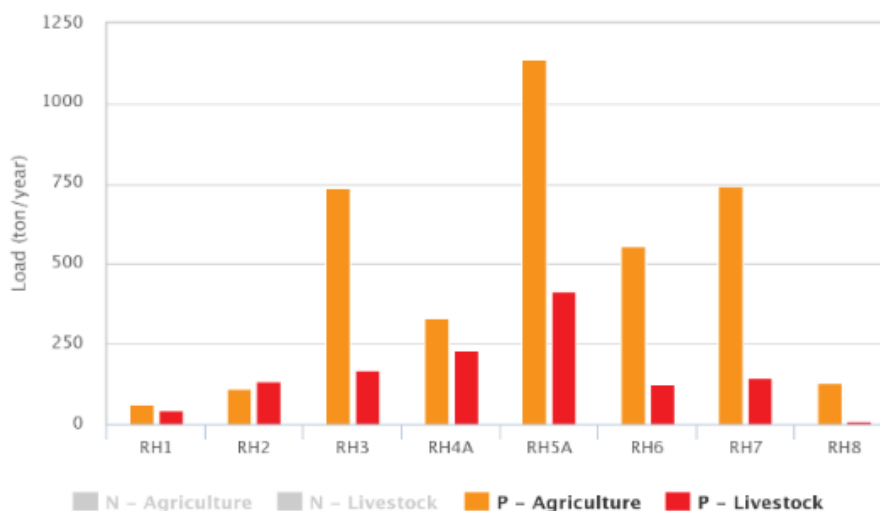
Water reservoirs, which are fundamental to irrigation, are subject to severe diffuse pollution by surface run-off to the reservoirs (Cortes et al., 2019) due to both inadequate pricing of water and insufficient farmer know-how. Since high temperatures and lack of precipitation are recurrent in Portuguese summer seasons, eutrophication often results in excessive algae growth and decomposition, exposing ichthyofauna to anoxia conditions and significant fish mortality.

TABLE 1: INPUTS FROM THE AGRICULTURAL AND LIVESTOCK SECTORS PER RIVER BASIN (TOTAL NITROGEN)



Source: APA, 2019.¹⁴³

TABLE 2: INPUTS FROM THE AGRICULTURAL AND LIVESTOCK SECTORS PER RIVER BASIN (TOTAL PHOSPHORUS)



Source: APA, 2019.¹⁴⁴

¹⁴³ RH5A concerns the Tagus river basin and RH7, the Guadiana river basin, currently most affected by irrigation projects.

¹⁴⁴ Idem.

1.2. Impacts on biodiversity and natural habitats, as well as landscape and cultural values

The expansion of irrigated agriculture may be one of the key drivers for the loss of natural habitats and biodiversity (Tegtmeier and Duffy, 2005; Savory and Duncan, 2016; Sánchez-Bayo and Wyckhuys, 2019; EDIA, 2020b). In the Alentejo region, highly impacted by the Alqueva irrigation system, the expansion of intensive agriculture occurs mainly in previous areas of extensive agriculture, as 70% of land use changes for agriculture in Alentejo occurred in detriment of grazing soils and 20% of forested areas (INE, 2020b). Irrigated farming of olive trees and almond trees currently occupies 80 000 ha (75%) of the Alqueva irrigation system, which implies a 180% growth between 2015 and 2019, although the impacts of this expansion in previously natural grassland areas are still unknown. Currently, the extensive agriculture system represented by the montado is also being degraded due to CAP coupled payments, which is leading to excessive overgrazing, in the face of "replacement of sheep by cattle, replacement of light indigenous breeds of cattle by heavier breeds, increase in the number of cattle heads, and shrub control practices using heavy machinery" (Pinto-Correia and Azeda, 2017).

This trend also significantly affects native fauna and flora dependent on the maintenance of this ecosystem: habitat loss is one of the major impacts of intensive agriculture expansion, destroying ecological continua and biodiversity, leading to a population decline of wild fauna such as birds, insectivorous mammals, and insects, including pollinators (Sánchez-Bayo and Wyckhuys, 2019). Loss of pollinators may have severe negative impacts in the future since it benefits production "in approximately 75% of major crops worldwide", being critical to food security (Cole et al., 2020). Therefore, irrigated agriculture's extensive use of pesticides may affect insect-pollinated crops and wild vegetation, bringing severe impacts on overall biodiversity.

1.3. Dam construction and creation of water reservoirs

Current dam construction is currently targeting the need for water by intensive agriculture, even though it represents one of the leading causes of biodiversity loss due to river discontinuity and creation of obstacles to the migration of fish, fragmentation of the fauna territories, destruction of riverine habitats and freshwater species. Like Spain and the rest of Western Europe, Portugal is already widely affected by damming. While the exact number of dams is still unknown, more than 8 000 barriers to river connectivity were identified through incomplete surveys by the Administrations of Hydrographic Regions (CNA, 2017). Additionally, a recent inventory identified nearly 1 200 dams and weirs in the Douro river basin alone, estimating that 25% were obsolete (Cortes et al., 2019).

Due to large scale sediment retention by dams, amongst other impacts such as excessive dredging, high-energy waves on the west coast, and improper urban planning, the coastline is greatly affected by erosion processes leading to a considerable loss of sandy shores (Santos et al., 2018), which tend to aggravate the effects of climate change, exposing a part of the urban population that live on the coast to sea-level rise. Despite these impacts, eight new dams are programmed for irrigation purposes, which will require an estimated investment of 190.5 million euros (DGADR, 2014), further increasing the risks and compelling to even more investments towards the protection of the coastline through heavy construction in the long run, already representing an estimated total cost of 684 million euros (APA, 2019).

1.4. Intensive use of water resources

The agricultural sector is the primary water consumer in Portugal, accounting for 74% of total consumption (MATE, 2016), and Portugal is one of the highest-spending countries in Europe in this regard (Eurostat, 2020). South of the Tagus river, where a big part of the intensification occurs, the Mediterranean climate that typifies local weather characteristics implies strong seasonality and interannual irregularity of precipitation: since rainfall is concentrated in late autumn and early spring, there is less water naturally available during summer, when it is most needed, limiting plant growth. Therefore, due to irregular rainfall, water is the most limiting factor in food production, being the main concern for increasing productivity.

In Portugal, the current promotion of irrigation is in low water availability areas and traditionally less likely to foster intensive agriculture. This trend occurs to the detriment of alternative nature-based solutions, such as promoting Natural Water Retention Measures, which "aim to safeguard and enhance the water storage potential of landscape, soil, and aquifers, by restoring ecosystems, natural features and characteristics of watercourses and using natural processes" (European Union, 2014).

However, climate change will probably lead to an increase in water scarcity (Bisselink, 2018) that would be incompatible with artificial water retention as planned since it may foster eutrophication, loss of retained water through evaporation (Barrona, 2015), irrigation-driven erosion, and increased soil salinity, in the absence of adequate irrigation systems that do not promote the leaching of salts from the root zone of soils (Abrol et al., 1988), considering the increase in average air temperature (IPMA, 2020).

It should be noted that a loss of 20% of national irrigated areas took place between 1989 and 1999 (DGADR, 2014), though this trend is due to the abandonment of traditional irrigation systems, mainly in the northern part of the country, where water availability is high (Fernandes, 2013). In contrast, new irrigation systems are **envisaged** of water deficit southern areas, in the Alentejo region (DGADR, 2014), putting under stress local water resources.

1.5. Current policy context

The expansion of irrigated farming is carried out under the European Agricultural Fund for Rural Development (EAFRD), dedicating €3.6 thousand million to Portugal between 2014 and 2020 (European Commission, 2020b). The EAFRD aims at contributing to the cross-cutting objectives of 1) fostering the competitiveness of agriculture and forestry; 2) ensuring the sustainable management of natural resources, and climate action; and 3) achieving a balanced territorial development of rural economies and communities including the creation and maintenance of employment, with an expenditure of 581.5 million euros in 2019, which represents 43% of CAP's total spending of 1 355.5 million euros in Portugal this year (European Commission, 2020c). Also, special attention is given to the environmental impacts of farming and its contribution to adapting regions to climate change under the new Farm to Fork Strategy (European Commission (2020a), particularly seeking to compensate farmers for adopting irrigation practices that ensure conditions for a more efficient and sustainable use of the water resource (MAFDR, 2019), along with promoting technological innovation in agriculture in order to increase environmental sustainability and job creation (MA, 2020).

At the national level, the PDR2020 targets "on-farm investment in more than 9 700 farm holdings, to facilitate the installation of more than 5 500 young farmers by 2023, and to provide more than 16 500 training places, mainly for farmers" (European Commission, 2020b), promoting the expansion of irrigated agriculture, which has been gaining importance. Thus, exports of agricultural and food commodities have presented a 71% growth since 2010, currently reflecting 14% of the country's total exports of goods (PORDATA, 2020a).

TABLE 3: PROJECTED PUBLIC INVESTMENT IN IRRIGATION AND INTENSIVE AGRICULTURE

<i>New irrigation projects</i>	<i>Public investment (€)</i>
Intensive agriculture of nuts (almond)	4 782 744
Expansion of the Alqueva irrigation system	264 130 000
New dams for irrigation	190 522 000
Total	554 634 744

Source: DGADR, 2014.

The effect on irrigated almond production is significant, as it allows high outputs: around 2.2 tonnes/ha, and average revenues of 7 825 €/ha in the Alqueva irrigation system, implying a total estimated economic value of 119 million euros due to a 33.5 tonnes production of the almond kernel in a 15 240 ha crop area. It should also be stated that this crop area increased by 32% between 2019 and 2020 (EDIA, 2020a) and 1 540% since 2009 (INE, 2021). However, the current outputs only provide a potential direct daily intake for the resident population in Portugal of 9 g per capita. Despite higher profitability of irrigated agriculture, it must be noted that, being commonly believed that one of the societal targets is rural development through job creation in the farming sector, depopulation of rural territories has not been halted. Also, it can hardly be stated that irrigation

expansion has created effective job opportunities for the local communities, since the municipalities where the Alqueva irrigation system was initially implemented are still subject to high unemployment rates: Moura representing 11% and Serpa, 7%, while the total of the Baixo Alentejo region has an average unemployment rate (median of the municipalities) of 6%, as of 2019 (PORDATA, 2020b). This is due to unfavourable working conditions as regarded by local inhabitants (Faget, 2018), compelling "the hiring of employment agencies to source cheap foreign labour to" seasonal work (Silveira et al., 2018).

2. POLICY OPTIONS

That said, a series of policy options might be considered:

- Promotion of water retention in soil, improving "its capacity to absorb water and hold it in its pores like a sponge" (Kent, 2016), in the short and the long term, making it available for human and agricultural consumption (Liu, 2017), while maintaining good water quality, also in compliance with the WFD, as well as of alternative irrigation methods, like wastewater (Pescod, 1992)
- Adaptation of food production methods to less irrigation, enhancing the efficiency of rainfed farming, and simultaneously assuring profitability and aligning with food consumption habits and cultures
- Implementation of policies that can be implemented to foster this transition through the CAP
- Promote an alternative allocation of economic resources as well as an overall strategy regarding food production, redirecting it towards extensive and non-intensive agriculture while assuring food self-reliance and security

Since 2013, greening measures for mitigation of ecological impacts were introduced in CAP's 1st Pillar, envisaging crop diversification, and maintaining permanent grassland while dedicating 5% of arable land to Ecological Focus Areas (EFAs). The 2013 CAP reform obliges EU member states to allocate 30% of their income support to greening. However, EFAs do not meet the environmental goals as they led to positive changes on only 5% of EU farmland, as 65% of farmers did not change their farming practices to qualify for the green payments (European Union, 2017).

2.1. Alternative Policy 1: Ecological Compensation Areas

Some mechanisms put in place in foreign countries show appealing opportunities for areas that the National Irrigation Program now targets: Japanese agro-environmental policies focus on rural development with the Direct Payment to Farmers in Hilly and Mountainous Areas (DPFHMA), targeting depopulation by providing rural communities with payments to ensure multifunctional environmentally friendly agriculture and reduce chemical fertilisers and pesticides, also guaranteeing the adoption of farming practices that contribute to reduce global warming and/or conserve biodiversity; in Europe, since 1993, Swiss farmers are required to set aside part of their agricultural land for extensive cultivation to receive government subsidies (Ecological Compensation Areas – ECAs), therefore, establishing predefined areas for ecological functions. Switzerland also created a payment for cultures with high energy content (*e.g.*, oilseeds, legumes, sugar beet) in lowland areas to ensure food production (Sterly *et al.*, 2018). These examples show some alternative ways to influence production in market-driven economies positively.

To receive direct government payments, at least 3.5% of the area dedicated to specialised crops and 7% of its remaining agricultural land must be assigned to ECAs by Swiss farmers. This mechanism has resulted in an average of 12% of Switzerland's total agrarian land being currently covered by ECAs (Kohli, 2014).

Applying the ECA mechanism to the intensive almond production in the Alqueva irrigation system, by dedicating 3.5% of the 15 240 ha crop area, would mean total average gross revenues of 115 million euros, through a total output of 33.5 tonnes of kernels from the remaining 14 700 ha crop area. Although it would mean a reduction in 11.7 tonnes of total estimated yield and 4 million euros less of gross revenues, still, it would mean an added 533 ha to habitat conservation. However, it would not be sufficient to meet the environmental and social requirements: setting aside 3,5% of the estimated

crop area for habitat conservation would still mean an overall water consumption of nearly 73.5 hm³/year through water abstraction, while increasing the dedicated percentage may affect profitability.

2.2. Alternative Policy 2: Promotion of Extensive Agriculture

Access to an adequate dietary provision of nuts through national production alone and achievement of environmental and social goals may be met through active promotion of extensive agriculture, ensuring the recommended daily intake of nuts *per capita*. It should be noted that the optimal production output to ensure the recommended dietary provision of nuts for the resident population in Portugal is nearly 97 280 tonnes/year.¹⁴⁵

Extensive almond agriculture can be characterised as an agroforestry system that uses relatively small amounts of capital while occupying larger amounts of land and depending on the natural climate and soil conditions. This model must ensure farmers' self-fulfilment and gratification, which is essential to transition to more sustainable practices (Pinto-Correia *et al.*, 2019). Almond trees were traditionally grown through extensive farming in the north-eastern territory of Trás-os-Montes, as well as in the southern Algarve region, occupying a total crop area of almost 39 000 ha in the late 1990s and early 2000s (GPP, 2007), declining afterwards to 26 840 ha in 2010, while again increasing 32% until 2018, covering an area of 35 500 ha. This growth was significant in Trás-os-Montes, with a 23% increase, while intensive almond production in Alentejo enabled a 466% increase (GPP, 2020). Due to the significant amount of semi-abandoned crop area with neglected cultural technique, traditional crops usually have productivity rates of 300-400 kg/ha, though well-designed rainfed almond crops can have 2 tonnes/ha outputs (Rodrigues *et al.* 2018), while recent dry farming techniques allow results of 600 to 800 kg/ha (Iglesias, 2019). However, considering the aforementioned 39 000 ha of suitable soils for dry farming of almond production in Trás-os-Montes and Algarve, there is a potential national output of almond of nearly 23 400 tonnes/year. Hence, almond production has optimal ecological conditions to be produced through rainfed farming since traditional farming of almond took place, especially in those regions, representing a potential total gross revenue of 95.6 million euros¹⁴⁶ distributed over 15 416 farmers, when implementing new technologies such as hedge-shape dry farming, a self-rooted plant system in hedge, adapting the concept of hedge plantation used in irrigation (Iglesias, 2019).

Acorn production covers a 1 million ha territory (Sousa Uva *et al.*, 2019), with a production of 590 to 830 kg/ha (Cañellas *et al.*, 2007), implying a total of 26 310 tonnes *per year* in Portugal (Sousa Uva *et al.*, 2019), providing a daily *per capita* intake of 12.4 g of acorns. Thus, conservatively, there is a potential output of 590 thousand million tonnes/year of acorn in the *montado*, though the economic viability of harvesting this production still needs to be analysed.

Extensive acorn production may consist of an alternative production model to intensive almond, due to its significance in terms of different consumption patterns. However, it should be highlighted that a detailed study is required of possible current uses of acorn that could be lost if it is redirected solely for human consumption; this is not done completely in this article.

Consisted of cork and holm oaks, it is recognised as a single and generic land-use type of traditional oak agroforestry (Mulatu *et al.*, 2016) that relies on the tree cover and the forestry component of the system (Pinto-Correia and Azeda, 2017). The *montado* also bears high natural, socioeconomic, and landscape values that mark the Alentejo region's strong cultural identity (Pinto-Correia *et al.*, 2019). Being an extensive agriculture system, the *montado* does not require irrigation; thus, it is perfectly adapted to expected water scarcity phenomena, and no infrastructure for irrigation must be put in place. Nevertheless, currently, the acorn has little economic value since it is used almost only for livestock consumption, associated with the production of high-quality black Iberian pig (Alegria *et al.*, 2020), leading to its under-exploitation and lack of profitability. In contrast, an estimated 54% of the production is left as waste in the fields after being eaten by livestock and wild fauna (Sottomayor, 2015). Adding to the *montado* in the Alentejo region, central and northern Portugal are also privileged areas for other oak species such as the Pyrenean oak (*Quercus pyrenaica*), the common oak (*Quercus robur*), and the Portuguese oak (*Quercus faginea*), occupying an area of almost 82 thousand hectares (Sousa Uva *et al.*, 2019) and representing an estimated yield of 96 800 tonnes of acorns. These outputs have a current real economic value of 6.3 million euros, from livestock

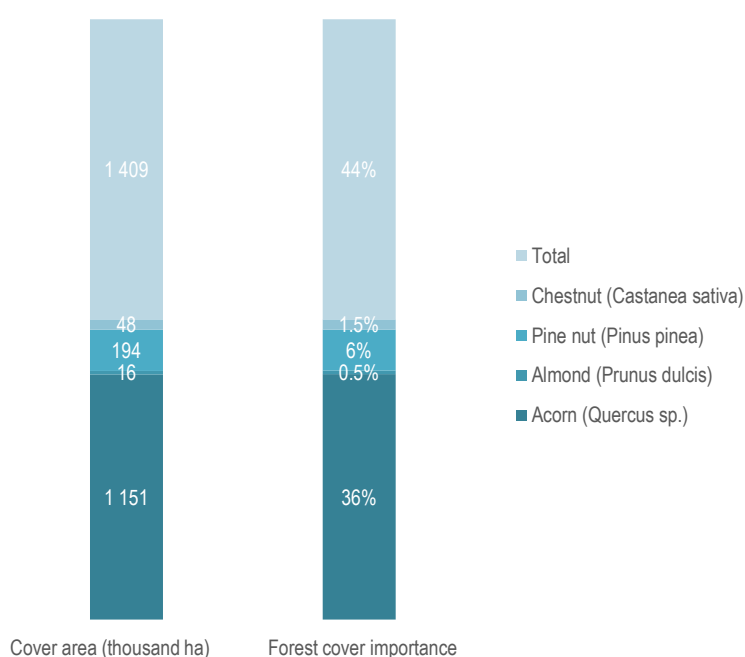
¹⁴⁵ Considering a daily intake of 30 g of nuts by a total population of nearly 8 884 000 people above 14 years old (PORDATA, 2020c).

¹⁴⁶ Considering a potential output of 27.3 tonnes of almond kernel at an average product value of 3.5 €/kg (EDIA, 2020a).

feeding, with a potential to represent 13,3 million euros, by using currently wasted acorns, distributed over 13 850 farmers, of which 9 300 are small farmers (Sottomayor, 2015). These values do not consider its use in human consumption, *via* transformation in several food products, like flour or processed food.¹⁴⁷

Though not indigenous, production of ecologically well-adapted exotic nuts can also occur through the exploitation of other representative species in Portugal, such as the stone pine (*Pinus pinea*) and the chestnut (*Castanea sativa*), both with relevant current economic use: the former occupies an area of nearly 194 thousand hectares and represents a 1 thousand tonnes yield of pine nut, with a unit value of 35.07 €/kg (Agri-Ciência, 2014) and the former, 48 thousand hectares (Sousa Uva *et al.*, 2019) and 47.5 thousand tonnes yield of chestnut (Laranjo, 2015). It should be stated that pine nut represents an economic revenue of almost 13 million euros through exports (the number of stone pine farmers is unknown, though its surface partially matches that of cork oaks since they are often farmed together) and chestnut, 150 million euros (Forum Florestal, undated), distributed over 16 310 farmers.

TABLE 4: AREA COVERED AND IMPORTANCE IN RELATION TO THE TOTAL FOREST AREA



Source: Sousa Uva *et al.*, 2019.

Considering all the estimated economic outputs and yields, it can be stated that in Portugal, there is an ecological potential to ensure the recommended daily dietary intake through extensive agriculture and dry farming alone while contributing to an average annual distribution of nearly 9 200 € *per farmer*¹⁴⁸ through the production of nuts:

¹⁴⁷ Some marketing experiences have been put in place by quite a few producers, such as Cooperativa de Usuários do Freixo do Meio, in Montemor-o-Novo, Alentejo.

¹⁴⁸ Estimated by the median.

TABLE 5: YIELD, GROSS REVENUES, AND DIETARY PROVISION POTENTIAL OF EXTENSIVE AGRICULTURE OF NUTS IN PORTUGAL

<i>Crop</i>	<i>Total output (tonnes)</i>	<i>Potential output (kg/ha)</i>	<i>Potential total gross revenue (M€)</i>	<i>Annual gross revenue per farmer (€)</i>	<i>Potential output for daily intake per capita (g)</i>
Acorn	40 517 ¹⁴⁹	590-830	13.3	₁₅₀	12.5
Pine nut	1 000	5	13	-	0.3
Chestnut	47 500	990	150	9 197	15
Almond kernel	25 350	650	177	10 900	7
Total	114 367	-	353,3	-	35

Source: Adapted from Sousa Uva et al., 2019.

Since extensive agriculture, agroecology, and agroforestry rely on pluriactivity and cultural diversification, there is room for a significant increase in income, even so, because of high landscape values that are simultaneously created, which may add relevant revenues from rural touristic activities (Vanslebrouck and Van Huylensbroeck, 2010). Public policies should then envisage the comprehensive promotion of extensive nut farming through agro-environmental measures under the CAP, limiting subsidies to specific geographical areas and crops, such as almond in the Trás-os-Montes and Algarve regions. Therefore, increasing the extensive nut farming area in agro-environmental measures to all the continental Portuguese territory while including all crops represents a major opportunity to ensure farmers' profitability, contributing to an adequate dietary provision of nuts according to recommended daily intake while providing habitat and biodiversity conservation. Considering the structure of existing agro-environmental measures, the public investment could, thus, take the following form:

TABLE 6: FINANCIAL SUPPORT OF NUT PRODUCTION THROUGH EXTENSIVE AGRICULTURE

<i>Farm size class</i>	<i>Occupied area (ha)</i>	<i>Value according to the farm area (€/ha)</i>	<i>Financial support (€)</i>
Maximum of up to 5 ha	39 081	60	2 344 860
Surface between 5 ha and 20 ha	26 615	40	1 064 600
Surface between 20 ha and 50 ha	6 437	20	128 740
Surface between 50 ha and 100 ha	2 894	10	28 940
Minimum surface of 100 ha	4 094	5	20 470
Total	79 121	-	3 587 610

Source: Adapted from Sousa Uva et al., 2019.

As most indigenous species grow slowly, these payments should hold for 30 years, following which the cultures can ensure financial return.

In order to calculate the total investment, the net present value (NPV) formula was applied, consisting in "the difference between the present value of cash inflows and the present value of cash outflows over [30 years]. NPV is the result of calculations used to find today's value of a future stream of payments" (Fernando and Mansa, 2021), relying on a 3% discount rate. That said, *the proposed investment would represent a Net Present Value of 66 731 129 euros over that period, paid by the CAP.*

¹⁴⁹ Considering current output of 26 310 tonnes plus an estimated 54% increase exploitation of acorns.

¹⁵⁰ The number of acorn and pine nut producers is unknown.

It should also be stressed that a current potential related to environmental and landscape values associated with habitat and biodiversity conservation represents high touristic potential, job creation due to low mechanisation, and protection of freshwater and soil resources. Since extensive grazing in oak areas is already promoted under CAP's agro-environmental measures, they were not considered. However, the low profitability of acorn leads to its estimated significant waste, even considering its consumption by domestic and wild fauna, which should be tackled through the public promotion of its human consumption by government authorities to create valorisation opportunities.

Joint direct-to-consumer advertising by both the Health and Agriculture Ministries of benefits of general nut consumption, with a focus on acorn consumption, through a comprehensive communication campaign, might represent about 600 thousand euros in the State budget,¹⁵¹ bringing along citizens' health improvements and ensuring food security and sovereignty, while contributing to rural development. However, since the economic outputs of this campaign are currently unknown, a dedicated, thorough economic study should be developed.

3. DISCUSSION

A comparison analysis between each policy makes it possible to conclude that promoting extensive agriculture of nuts would alone ensure the recommended dietary provision of nuts while achieving high standard environmental conservation and rural development. On the contrary, endorsing the intensive production of nuts, which is currently based on irrigated almond farming, does not meet these desired goals, bringing severe environmental impacts. The expected outcomes of the different policy options considering mainly almond production would bring the following results:

TABLE 7: COMPARISON OF POLICY OPTIONS AND EXPECTED OUTCOMES

	<i>Current strategy</i>	<i>Policy option 1</i>	<i>Policy option 2</i>
Targeted goals	<i>Business-as-usual scenario (promoting the expansion of almond through irrigated agriculture)</i> <i>Baseline 2020</i>	<i>Expansion of irrigated almond crops with stronger environmental requirements</i>	<i>Promotion of alternative extensive agriculture of almond and acorns</i>
Water consumption	Over-use/extensive (76.2 hm ³ in Portugal without considering new projected irrigation systems)	Minimised (73.54 hm ³ in Portugal)	Adequate (no irrigation system required)
Economic return (gross revenues)	High (7 825 €/ha; 119.3 M€ total in Portugal)	High/medium (7 825 €/ha; 115.1 M€ in Portugal), though Ecological Compensation Areas may bring alternative residual revenues	Medium/low (4 550 €/ha; 177 M € in ecologically suitable areas for almond trees but distributed over a much more significant number of farmers, plus 13.3 M € for acorn)
Production outputs	High (2.2 tonnes/ha; 23 000 tonnes of almond kernels in Portugal)	High/medium (2.2 tonnes/ha; 33.5 tonnes of almond kernels in Portugal)	Medium (650 kg/ha; 25 350 tonnes of almond kernels in ecologically suitable areas in Portugal but distributed over many more farmers). Acorn outputs may reach 310 kg/ha (total of 40 517 tonnes)
Access to adequate dietary provision	Medium/low (9 g almond)	Medium/low (8.7 g almond kernel)	High (7 g/person/day of almond kernels. 12.5

¹⁵¹ Considering similar communication campaigns for the promotion of specific fish species. E.g. “Vamos conservar o que é nosso” campaign, from ANICP (Portugal 2020, 2020).

	kernel/person/day)	gr/person/day)	g/person/day of acorn)
Biodiversity and habitat conservation	Decreases (since 2015, intensive farming of almond increased from 975 ha to 15 241 ha: more than 15 times)	Minimised (3.5% of 15 241 ha of intensive farming of almond would be dedicated to habitat conservation: 533 ha)	Increases (conservation of additional 12 160 ha of extensive dry almond farming)
Water quality and river ecology	Decreases (through the construction of dams for water abstraction)	Decreases (same as option 1)	Increases (halt of new dams for irrigation and adaptation of existing ones)

Source: Adapted from Sousa Uva et al., 2019; EDIA, 2020a.

Policy option one is not considered an effective alternative to fully achieve sustainability goals since the negative impacts are only minimised, changing little in the food production system considering the need to adapt significantly to future water scarcity scenarios. Despite bringing positive outcomes, such as an increase of areas dedicated to habitat and biodiversity conservation, it does not represent a major change in the nuts production system nor adequate dietary intake.

Policy option two targets production through extensive agriculture alone, comparing almond productions and a mix of crops (chestnut, pine nut, and acorn). While supporting habitat and biodiversity conservation, it would generate more than 353 million euros in gross revenues and contribute to preserving traditional areas of extensive agriculture, implying no further use of water resources. It is, therefore, considered the best option considering its environmental and social impacts.

4. CONCLUSIONS

Besides being water-intensive, the current characteristics of almond production have probably caused several other specific environmental impacts, identified over the last decade, which are tightly linked to the intensification of agriculture. These impacts concern the loss of biodiversity and natural habitats, and groundwater pollution. Thus, a different set of public policies for the promotion of rainfed nuts farming, would adequately boost employment, water retention, biodiversity, and habitat conservation through a potentially more adequate soil cover and favouring crops and farming methods that are better adapted to soil and climate conditions. This way, alternative solutions supported by public policies should be held, focusing on the adaptation to climate change and expected water scarcity events (Bruyninckx, 2019). These solutions must encompass new methods of water retention and storage in the subsoil, food production habits, consumption and societal demands (EEA, 2015), promotion of biodiversity, and preservation of natural habitats and soils.

Research and development by public entities must be pushed to develop less water-consuming methods and plant varieties. As an example, taking into account the importance of providing nuts at an affordable price, there is an opportunity to invest in dry farming varieties of the almond tree.

Public policies should, therefore, target the profit of farmers and job creation in sustainable and extensive farming methods while halting perverse incentives to increase intensive production:

1. Promote alternative methods of non-water intensive nut production
 - a) Removing geographic limits of subsidised extensive nut farming to ensure minimum production and profitability for all nut producers through agro-environmental measures
 - b) Launching a communication campaign to promote the benefits of acorn consumption to the general public
2. Foster research in alternative solutions for water retention and irrigation
 - a) Promotion of reuse of treated wastewater and agricultural run-off

- b) Evaluation and improvement of the green water ratio in soils
- c) Increase of water infiltration and small-scale water-holding capacity

Since there is a lack of knowledge about alternative solutions for water retention and irrigation, the research should be done (policies 2.a), b) and c)) to understand technical requirements and economic costs by competent administrative authorities (Directorate-General for Agriculture and Rural Development – DGADR and Regional Directions of Agriculture and Fisheries – DRAP) with close partnership with local farmers and NGOs. Thus, even though more studies are needed to ensure proper water retention and use and flow of production, a set of priorities should swiftly be pushed for the prevention of adverse environmental impacts, improvement of dietary intake, and the guarantee of job creation in rural areas, aiming at promoting extensive production.

ACKNOWLEDGEMENTS

This work was supported by Gulbenkian Foundation under project LEAP – Policy Development Initiative and by MAVA – Fondation pour la Nature under project Reconnecting Iberian Rivers. Ricardo Próspero also acknowledges Alfredo Sendim, from Cooperativa de Usuários do Freixo do Meio, for the information on acorn transformation, and Pedro Foles, from Agromillora.

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A insegurança hídrica na agricultura

Como garantir abastecimento de água para ter regadio no futuro? Um caminho para a sustentabilidade

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ABSTRACT

Water is vital to maintain agriculture and rural areas alive. Desertification and climate change show us how fragile our country is, through fires and droughts.

Without water to develop agriculture and tackle climate change, there will be no people living in rural areas. In this areas we lost youngsters and 25% of the population are farmers, mostly elderly, over 65 years old.

In 20 years we've lost half of the farms and more than two hundred and forty thousand hectares of irrigated area (twice the area built in Alqueva). Most of the farms that disappeared had irrigation. Irrigated areas occupy only 5% of the territory but ensure 60% of the national food production. We import 3 times more than in the beginning of the century and we are a long way from the goal of balancing the agri-food trade in 2020, set five years ago.

We have to plan for the future. It urgent to promote a broad debate and to introduce a new political agenda of the need to guarantee water security in agriculture in order to stop the trend of agricultural abandonment, guaranteeing food security. It's time to establish a National Policy for Irrigation for the long future and the 5 essential measures identified in this work are:

1. Increase water storage (to respond to interannual regulation)
2. Modernize irrigation infrastructures and create new areas (to increase efficiency and resilience)
3. Practice of precision irrigation (to optimize the management)
4. Certification of efficient irrigated areas (for environmental sustainability)
5. Innovation and capacity built support systems

Keywords: Irrigation, sustainability, efficiency, water storage, climate change.

JEL classification: Q, Q1.

RESUMO

A água é estratégica para manter a nossa agricultura e os territórios rurais vivos. A força da desertificação e das alterações climáticas mostram-nos a fragilidade do nosso território, através dos incêndios e das secas, entre outras. Sem água para desenvolver a agricultura e fazer face às alterações climáticas, não haverá fixação de pessoas no interior, sendo a agricultura o grande motor

da economia destas regiões. Nas zonas rurais perdemos os jovens e 25% da população são agricultores, a maioria idosos, com mais de 65 anos (ONU, 2015).

Em 20 anos perdemos metade das explorações agrícolas e mais de 240 mil hectares de área de regadio (o dobro da área construída em Alqueva). A maioria das explorações que desapareceram tinham área equipada para regadio. As áreas regadas ocupam apenas 5% do território mas asseguram 60% da produção alimentar nacional (INE, 2017). Importamos quase 3 vezes mais do que no início do século e estamos muito longe da meta do equilíbrio da balança comercial agroalimentar em 2020, traçada há cinco anos (Jornal de Negócios, 2015).

Há que planificar o futuro. É urgente promover o debate alargado e introduzir uma nova agenda política sobre a necessidade de garantir segurança hídrica na agricultura para travar a tendência de abandono agrícola, garantindo a segurança alimentar. É altura de desenvolvermos uma Política Nacional para o Regadio a longo prazo e são 5 as medidas essenciais que foram identificadas com este trabalho:

1. Aumentar a capacidade de armazenamento de água (resposta interanual)
2. Modernizar infraestruturas de rega e criar novas áreas (aumentar eficiência e resiliência)
3. Práticas de rega de precisão (otimizar a gestão)
4. Certificação de áreas de regadio eficiente (sustentabilidade ambiental)
5. Inovação e capacitação

Palavras-chave: Regadio, sustentabilidade, eficiência, capacidade de armazenamento de água, alterações climáticas

Classificação JEL: Q, Q1.

1. INTRODUÇÃO

Este estudo de política visa essencialmente responder à questão: *o que fazer para ter água para a agricultura no futuro?*

A água é estratégica para manter a nossa agricultura e os territórios rurais vivos. A força da desertificação e das alterações climáticas mostram-nos a fragilidade do nosso território através dos incêndios e das secas, entre outras.

Não tenhamos ilusões: sem água para desenvolver a agricultura e fazer face às alterações climáticas, não haverá fixação de pessoas no interior. Nas zonas rurais perdemos os jovens e 25% da população são agricultores, a maioria idosos, com mais de 65 anos (ONU, 2015).

Em 20 anos perdemos metade das explorações agrícolas e 244 mil hectares de área de regadio (o dobro da área construída em Alqueva). A maioria das explorações que desapareceram tinham regadio. Importamos quase 3 vezes mais do que no início do século e estamos muito longe da meta do equilíbrio da balança comercial agroalimentar em 2020 traçada há cinco anos (Jornal de Negócios, 2015).

Não há crise que não revele a importância de produzirmos os nossos alimentos e termos capacidade instalada no nosso país. A crise Covid foi (é) um desses momentos.

É importante, por um lado, listar os efeitos atuais e a extensão do problema em Portugal e o que está a ser feito como resposta e, por outro, definir alguns princípios orientadores das políticas públicas antes de abordar, na parte final, as opções de política que podem ser estruturantes para a segurança hídrica do país.

Há que planificar o futuro. Portugal possui um volume de recursos hídricos abundante (águas superficiais e subterrâneas)(AR, 2016), quando considerada a relação entre afluências médias anuais e volume utilizado. Se compararmos o volume de água utilizada com as afluências anuais (47.840 hm³), Portugal utiliza uma pequena parte das disponibilidades hídricas (somente 9% do total), o que significa que a agricultura utiliza apenas 7% (3.390 hm³) das disponibilidades hídricas anuais.

Existe sim uma desajustada “recarga” dessas capacidades (através da precipitação), quer em termos regionais (não chove de igual forma em todas as regiões do País) quer em termos temporais (não temos precipitação ao longo de todo o ano, nem com o mesmo padrão entre anos), e uma reduzida capacidade de armazenar água: apenas 20% do total das afluências. Por outro lado, o País não dispõe de uma “rede hídrica” que permita, em cada momento, disponibilizar a água, para os diversos fins,

nos locais e nos volumes em que ela é necessária. Ou seja, o armazenamento de água é um elemento base para a gestão dos recursos hídricos e crítico para apoiar um desenvolvimento resiliente. O futuro passa por **reconhecer a oportunidade estratégica da disponibilidade de água que existe nas nossas bacias hidrográficas e valorizar, de forma sustentável este recurso, as potencialidades do nosso território para armazenar água e desenvolver a agricultura, como fatores de coesão.**

O Pacto Ecológico Europeu (European, 2019) constitui uma oportunidade para valorizar o papel da água na agricultura no nosso País, com um desenvolvimento harmonioso. A própria Comissão Europeia preconizou um mecanismo eficaz para uma transição justa e inclusiva para todos e, através da **Lei Europeia do Clima** (European, 2020), renovar a atenção para a adaptação às alterações climáticas, a fim de reforçar a resiliência da Europa.

Como afirmou a Ministra da Agricultura no Conselho de Ministros de Agricultura e Pescas, de 27 de janeiro de 2020, sobre o Pacto Ecológico Europeu, *“sublinhamos o papel dos fundos estruturais no que respeita à criação de infraestruturas coletivas, caso de barragens, diques, redes de proteção contra incêndios, essenciais ao desenvolvimento das atividades produtivas, determinantes na prevenção e/ou no restabelecimento para fazer face a eventos climáticos extremos”* (Governo X. , 2020).

É urgente promover o debate alargado e introduzir uma nova agenda política sobre a necessidade de garantir segurança hídrica na agricultura para travar a tendência de abandono agrícola, garantindo a segurança alimentar. É vital o país construir um novo paradigma para identificar e gerir os riscos, não só o risco falta de capacidade de regulação hídrica, mas também o risco climático, de desertificação, do despovoamento, da perda de tecido produtivo e outros, incluindo novas pandemias.

O presente estudo identifica um conjunto de opções de política – a atual, a identificada por *stakeholders* e a abordagem alternativa. São avaliadas através de uma estrutura baseada na combinação de metas e restrições de forma a permitir uma decisão baseada em evidências.

2. A CAUSAS DA INSEGURANÇA HÍDRICA

A **segurança hídrica** é a garantia de disponibilidade hídrica nos diferentes usos (inclusive o ambiental). A avaliação de segurança hídrica envolve a variabilidade e mudança climática e alterações antrópicas nos sistemas hídricos.

As causas do problema da insegurança hídrica resulta de um conjunto de condições, algumas delas estruturais, como as características do próprio clima mediterrânico, com acentuada irregularidade da precipitação e da temperatura no espaço e no tempo, que gera a necessidade de armazenar água.

As alterações climáticas têm vindo a agravar o nosso clima mediterrânico, com redução da precipitação e aumento da temperatura e eventos extremos mais intensos e mais frequentes.

Ao longo dos anos tem-se verificado um insuficiente investimento em infraestruturas de armazenamento de água e na modernização dos sistemas existentes, bem como falta de apoio a tecnologias de gestão da água e aplicação prática do conhecimento existente.

Por outro lado, com o aumento da eficiência hídrica, tem-se verificado um aumento dos custos de produção, quer pelo investimento em equipamentos mais eficientes, quer pelo consumo de energia, bem como uma penalização através do regime económico e financeiro, resultante da Lei da Água (AR, 2005), que introduz o pagamento de uma taxa pelo uso dos recursos hídricos, a TRH¹⁵², e aplica valores mais elevados em regiões onde a disponibilidade de água é menor (AR, 2017).

Acima de tudo, a insegurança hídrica na agricultura resulta da falta de uma política nacional de longo prazo, com visão integral e entendimento geral dos fenómenos. A **principal causa do problema está assim em não ser uma prioridade para os decisores políticos a definição de um rumo de Política Nacional para o Regadio.**

Os *stakeholders* do setor agrícola reconhecem e exigem um plano que defina um caminho a seguir para o setor do regadio, alinhado com os objetivos de sustentabilidade ambiental e que responda às necessidades do sector agrícola e da sociedade.

¹⁵² Desde 2008 existe um regime económico e financeiro dos recursos hídricos onde se estabelece o pagamento da taxa de utilização dos recursos hídricos por parte do setor agricultura e outros. A última atualização desta legislação foi em 2017.

O atual Programa Nacional de Regadios, cuja primeira fase irá até 2023, é um conjunto de investimentos no regadio público e não define uma estratégia holística. A segunda fase deste Programa está prevista no Programa Nacional de Investimentos 2030 e seguirá, a mesma “linha” de ação do anterior.

Porquê uma **Política Nacional para o Regadio**?

- Para responder às necessidades do “**Programa Nacional de Regadios, 1.ª e 2.ª fases**” e outras políticas do Governo, Planos, Estratégias e Metas, tais como a Estratégia Nacional de Adaptação às Alterações Climáticas, o Plano Estratégico da Política Agrícola Comum (PEPAC), Plano de Recuperação e Resiliência, entre outros.
- Fornecer uma linha de base para um desenvolvimento focado do setor do regadio em Portugal, com desenvolvimento direto das questões no setor do regadio que foram pouco abordadas por outras políticas setoriais
- Abranger as intervenções necessárias para que o setor contribua efetivamente para o aperfeiçoamento da produção e produtividade no setor agrícola
- Existe evidente aumento da insegurança alimentar

3. AS EVIDÊNCIAS-CHAVE E AS OPORTUNIDADES DE TRANSFORMAÇÃO

Os efeitos atuais decorrentes da insegurança hídrica no nosso território são, em particular, os seguintes:

- Elevado impacto provocado pelas secas e cheias, com aumento da frequência e da intensidade de eventos extremos potenciados pelas alterações climáticas
- Aumento das áreas aridas
- Aumento da desertificação
- Perda de biodiversidade
- Abandono das áreas rurais e redução da população no interior, com maior pressão nos grandes centros urbanos e no litoral.
- Abandono da atividade agrícola e redução das áreas de regadio
- Dependência alimentar externa
- Diminuição do autoaprovisionamento alimentar devido à menor capacidade produtiva
- Aumento dos custos de produção (maior necessidade de bombagem, preço da energia e TRH estrangulam maior eficiência hídrica)
- Elevado preço da água devido à escassez do recurso levam a que os investidores optem por culturas de maior valor acrescentado para o investimento no uso do recurso água em vez de bens alimentares de primeira necessidade.
- Maior pressão sobre o recurso água (menor oferta para os vários usos)
- Falta de resiliência das explorações agrícolas ao clima mediterrânico e ao efeito das alterações climáticas
- Não renovação geracional no sector agrícola e nas zonas rurais
- Agravamento do problema da coesão territorial
- Hostilidade da opinião pública por desconhecimento do que é a agricultura, nomeadamente de regadio
- Redução da representatividade política do mundo rural e da agricultura.

Decorrente destes efeitos, a principal extensão do problema que se evidencia é o risco do desaparecimento do sector primário e a dependência total externa de alimentos.

Neste âmbito é importante analisar as evidências-chave de cada um dos efeitos identificados, perceber o seu impacto e, no seu conjunto, a tendência futura.

- **Elevado impacto das secas, com aumento da frequência e da intensidade de eventos extremos potenciados pelas alterações climáticas**

As secas têm impacto significativo em múltiplas esferas da atividade humana e no âmbito mais vasto dos recursos naturais, sobretudo efeitos negativos nos ecossistemas e na biodiversidade, no risco de incêndios e na degradação dos solos (desertificação).

Desde o início do século já ocorreram cinco períodos de seca¹⁵³ e existe o agravamento do seu efeito em todo o território de Portugal. Em 2017, 97% do continente português atingiu as classes mais elevadas deste índice, seca severa e extrema (IPMA, 2017). As anomalias da precipitação e da temperatura, revelam maior frequência de anos mais quentes e mais secos desde o virar do século.

- **Aumento das áreas aridas**

Os cenários das alterações climáticas fazem prever o aumento significativo de condições meteorológicas propícias a grandes áreas aridas em todo o território de Portugal. O ano 2017 foi marcante, ao registar a maior área arida desde 1995 e por se ter tornado o ano mais trágico de sempre, quer em termos de vidas humanas quer em termos económicos e ambientais. Os grandes incêndios de Pedrógão Grande e Góis mostraram-nos, mais dramaticamente do que nunca, as terríveis consequências da intensidade dos fenómenos da seca e do abandono da atividade agrícola.

O desaparecimento acentuado das explorações agrícolas torna evidente o aumento exponencial da área arida quando a proporção da Superfície Agrícola Utilizada¹⁵⁴ e da Superfície Agrícola e Florestal (SAU/SAF) se reduz abaixo do limiar 40% (Cordovil, 2019).

- **Aumento da desertificação**

A desertificação é uma forma de degradação dos solos em terras áridas e uma ameaça crescente em Portugal. Os cenários de alterações climáticas indicam um aumento da vulnerabilidade à desertificação ao longo deste século em toda a Europa, com efeitos particularmente intensos em Portugal, de aumentos das temperaturas e das secas, bem como uma diminuição da precipitação (ECA, 2018).

Mais de 5,5 milhões de hectares de Portugal, que significa mais de 50% da superfície total do território continental português, estão em risco de desertificação e mais de 30% regista vulnerabilidade “muito elevada” ou “elevada” (ICNF, 2014).

Na produção alimentar futura, as projeções climáticas estimam, por exemplo, redução de 50% na produtividade do milho, trigo e beterraba sacarina, em regime de sequeiro no Sul da Europa, no ano 2050 e o valor económico das terras agrícolas pode ver-se reduzido em 80% até final do século, levando à desertificação das zonas rurais (ECA, 2018).

- **Perda de biodiversidade**

O declínio da biodiversidade decorre das mais variadas atividades humanas a que se soma o contributo marcadamente negativo das alterações climáticas. A biodiversidade, os ecossistemas que a suportam, o solo e os recursos hídricos, são ativos estratégicos essenciais para os objetivos da coesão territorial, como preconiza a Estratégia Nacional de Conservação da Natureza e Biodiversidade 2030.

Numa análise balanceada, a produção mais elevada e o uso de menor área, é inequivocamente favorável à biodiversidade. Intensificar algumas áreas para produção de alimentos permite libertar outras áreas para conservação da natureza e proteção de habitats. Cada hectare regado tem capacidade de produzir o equivalente a cerca de 6 a 7 hectares de sequeiro (INE, 2014), contribuindo para manter áreas significativas do território em regime de produção mais extensivo e a sustentabilidade de determinados sistemas agrícolas (maior capacidade para remunerar o solo). Como necessita de menos área, o regadio permite libertação de áreas que idealmente podem ser usadas para conservação da natureza.

¹⁵³ Anos 2004/05, 2008/09, 2011/12, 2014/15 e 2016/17.

¹⁵⁴ SAU: constituída pelas terras aráveis (limpa e sob coberto de matas e florestas), culturas permanentes, pastagens permanentes e horta familiar (INE, Inquérito à Estrutura das Explorações Agrícolas 2016, 2017).

É necessário analisar prós e contras no balanço em termos de biodiversidade. Apesar de não existirem estudos que o comprovem, a substituição de áreas de montado para olival, ou de áreas de pastagens pobres para olival, em termos de biodiversidade, o balanço é claramente distinto.

- **Abandono das áreas rurais e redução da população no interior, com maior pressão nos grandes centros urbanos e no litoral**

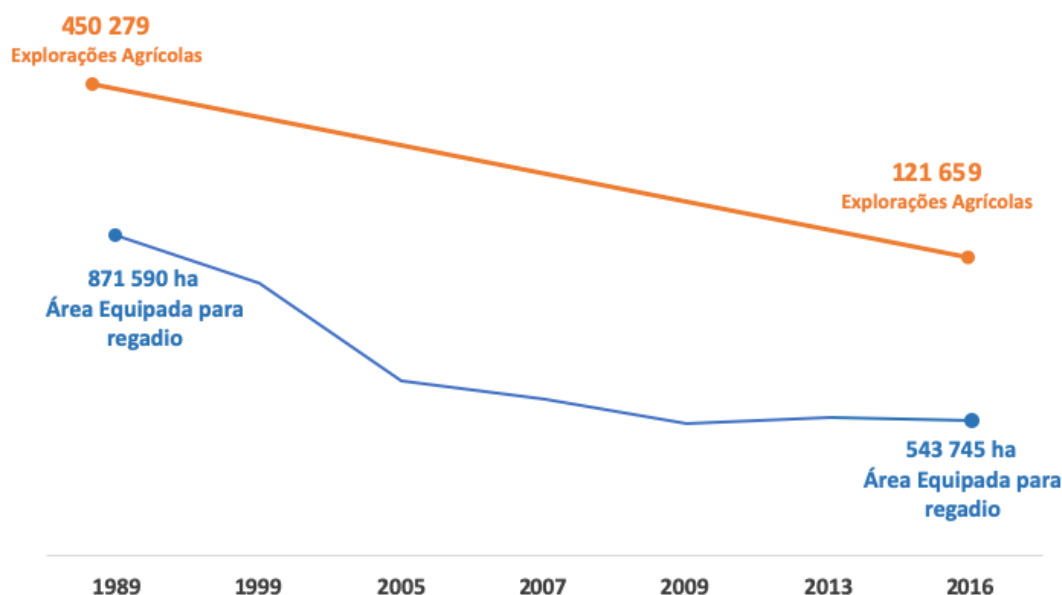
A variação da população residente demonstra o fenómeno de despovoamento que tem existido, em particular, nas zonas rurais. A densidade populacional do interior é 372 vezes mais pequena que no litoral (Governo X. , 2017). Em meio século, o interior perdeu quase 40% das pessoas, 60% da população do país vive a pelo menos 25 quilómetros da costa e as áreas metropolitanas de Lisboa (2,8 milhões) e do Porto (1,8 milhões) concentram cerca de 45% do total da população residente no continente. Apenas 17,6% dos jovens vivem no Interior.

Nas zonas rurais, os produtores agrícolas representam cerca de 25% da população residente e a maioria são idosos (>65 anos) (ONU, 2015). Os agricultores portugueses são os mais envelhecidos da UE-27, apresentando a maior percentagem de agricultores com mais de 65 anos, 51,9%. Portugal é também um dos Estados-Membros com menor peso dos jovens agricultores (1,9% de produtores portugueses tem menos de 35 anos).

- **Abandono da atividade agrícola e redução da área de regadio**

Os dados estatísticos mostram que Portugal tem atualmente 121 mil explorações com infraestruturas de rega instaladas (51% das explorações), com capacidade para regar 543 mil hectares. Desde 1989 que a área de regadio tem vindo a diminuir. Nessa altura tínhamos 450 mil explorações com infraestruturas de rega, com capacidade para regar 870 mil hectares de área equipada para regadio. Em pouco mais de 2 décadas, o número de explorações com superfície equipada para regadio diminuiu 72% (menos 329 mil explorações) e a área equipada para regadio diminuiu 38% (menos 328 mil hectares (INE, 2017)). A proporção correspondente de superfície equipada para regadio na superfície agrícola útil (SAU)¹⁵⁵ diminuiu 7%, regista o valor mais baixo de sempre, 15%. As figuras 1 e 2 mostram a evolução destes valores.

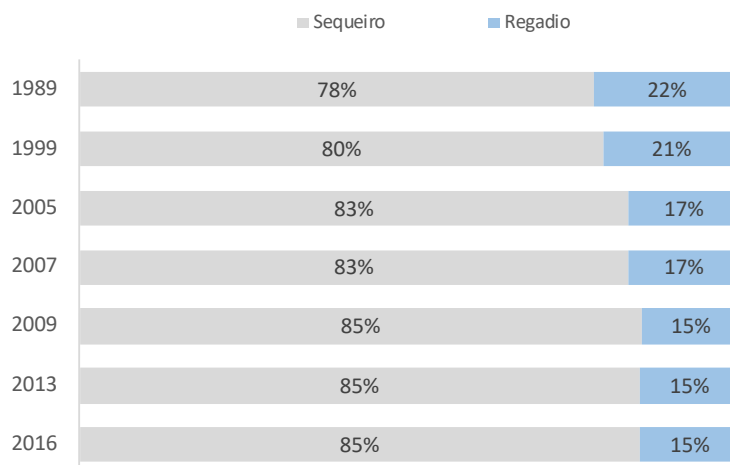
FIGURA 1: EVOLUÇÃO DA ÁREA EQUIPADA PARA REGADIO E RESPECTIVO N.º DE EXPLORAÇÕES



Fonte: INE, 2017.

¹⁵⁵ O indicador apresenta a área total irrigável e é expresso em hectares (ha) em percentagem da superfície agrícola utilizada (SAU).

FIGURA 1: PROPORÇÃO DE ÁREA EQUIPADA PARA REGA NA SAU (%).



Fonte: INE, 2017.

A área regada atual é de 474 061 ha, o que significa 86,5% de taxa de utilização da área equipada para regadio¹⁵⁶, um uso evidente da capacidade instalada.

- **Dependência alimentar externa**

A importância da produção endógena de cada país, de modo a diminuir a sua dependência externa é determinante, não só do ponto de vista económico, como estratégico. Portugal produz uma diversificada quantidade de produtos alimentares mas, na verdade, há produtos, como os cereais, a carne ou o arroz, em que não somos autossuficientes. Só somos excedentários em azeite, vinho, leite e hortícolas.

Como exemplo, a produção de cereais apresenta um grau de autossuficiência¹⁵⁷ da ordem dos 20,5%, abaixo do registado em 2007, que se situava nos 24,3% (GPP, 2018). Isto significa que o restante temos de importar para suprir as nossas necessidades em cereais.

O nosso grau de autoaprovisionamento¹⁵⁸ de bens alimentares ronda os 80% e temos um dos maiores défices da balança alimentar da Europa. Entre 2018 e 2019 o défice da balança comercial era de 3,7 mil milhões de euros, (importações 10,8 mil milhões de euros e exportações 7,1 mil milhões) (GPP, 2020), o que quer dizer que estamos muito longe da meta do equilíbrio da balança comercial agroalimentar em 2020, traçada há cinco anos.

- **Diminuição do autoaprovisionamento alimentar devido à menor capacidade produtiva**

O abandono da atividade agrícola, em particular o abandono de explorações de regadio, condiciona obviamente a capacidade produtiva. Mais de metade das explorações agrícolas têm regadio (INE, 2017).

A produção de alimentos em quantidade suficiente para suprir as necessidades da população portuguesa e para manter o dinamismo das nossas exportações agroalimentares, depende do regadio. Devido ao seu efeito multiplicador, cada hectare regado tem capacidade de produzir o equivalente a cerca de 6 a 7 hectares de sequeiro (INE, 2014), contribuindo para manter áreas significativas do território em regime de produção mais extensivo e a sustentabilidade de determinados sistemas agrícolas (maior capacidade para remunerar o solo). Como necessita de uma

¹⁵⁶ Relação Área regada/Área equipada para regadio

¹⁵⁷ Autossuficiência alimentar de um dado País pode ser definida como sendo a sua capacidade para satisfazer as necessidades de consumo de bens alimentares da sua população, através da respetiva produção interna e/ou da importação de bens alimentares financiados pelas correspondentes exportações.

¹⁵⁸ Grau de autoaprovisionamento = produção/consumo aparente = produção / (produção + importações-exportações)

área menor, o regadio permite uma libertação de área que idealmente pode ser usada para conservação da natureza.

A atual área regada representa apenas 13% da SAU e 5% do território nacional, sendo responsável por 60% da produção alimentar (INE, 2017). É relevante assinalar que as explorações de regadio, não obstante representarem em 2016 menos de 1/4 do total de explorações e 10,9% da SAU, geraram 36,2% do Valor de Produção Padrão Total (VPPT)¹⁵⁹ nacional.

- **Aumento dos custos de produção (maior necessidade de bombagem e preço da energia estrangulam maior eficiência hídrica)**

A escassez de água impõe um ponto de partida deficiente em termos de regulação natural dos recursos, com custos de produção superiores face a outras regiões e países que competem com a nossa agricultura e que têm maior disponibilidade de recursos hídricos.

Portugal reduziu para menos de metade o volume de água por área regada. Esse incremento na eficiência de uso da água (-56%) significou um aumento exponencial de consumo de energia. Nos anos 60 o consumo unitário de energia por área era de 200 kWh/ha, sendo atualmente de 1.534 kWh/ha (+670%). A evolução no padrão de utilização de água na agricultura foi assim realizada com recurso ao consumo de energia que, em média, representa 30 a 40% dos custos operacionais com a rega e chega a representar 75% do custo do serviço de abastecimento de água nos regadios coletivos públicos¹⁶⁰ (GPP, 2019). Devido às secas, a necessidade de bombagem é ainda maior, agravando ainda mais os custos de produção.

O preço da energia estrangula uma maior eficiência hídrica num setor em que as margens de lucro não existem ou são muito baixas. A limitação é maior para a transição de uma rega em gravidade para um equipamento de rega em pressão, que induz maior eficiência no uso da água. Além do preço elevado do kWh de energia ativa, a penalização é agravada por custos de contratos desadequados à sazonalidade da atividade: as taxas fixas dos contratos de eletricidade representam 20 a 30% do total da fatura (Egg & Valores, 2017). Em Espanha e França, por exemplo, onde o regadio também é determinante, têm a possibilidade deste tipo de contratos sazonais.

Este conjunto de elementos aplicados ao uso da água, por agravar o preço da água, estrangulam uma maior eficiência hídrica na agricultura.

O elevado preço da água devido à escassez do recurso leva a que os investidores optem por culturas de maior valor acrescentado para o investimento no uso do recurso água. Esta tendência veio a acentuar-se em Alqueva, onde o preço da água é mais elevado. As culturas que não podem suportar o preço da água, deixam assim de ser opção, diminuindo o leque de culturas. O aumento do preço da água tem este efeito pernicioso.

- **Maior pressão sobre o recurso água (menor oferta para os vários usos)**

A menor disponibilidade de água, agravada pelos períodos de secas e as alterações climáticas, impõe maior pressão sobre o recurso água e uma menor oferta para os vários usos.

O Plano Nacional da Água (AR, 2016) mostra que o volume de água utilizada anualmente é de 4.557 hm³ e distribui-se da seguinte forma pelos diferentes sectores:

- Urbano: 904 hm³ (20%);
- Industrial: 229 hm³ (5%);
- Agricultura e pecuária: 3.390 hm³ (74%);
- Turismo: 34 hm³ (1%).

A fração aparentemente “pesada” de 74%¹⁶¹ no uso agrícola revela a intrínseca necessidade de uso da água no nosso clima mediterrânico. No entanto este valor representa o volume bruto que é

¹⁵⁹Corresponde à soma dos diferentes Valor de Produção Padrão obtidos para cada atividade, multiplicando os VPP pelo número de unidades (de área ou de efetivo) existentes dessa atividade na exploração (INE, 2017).

¹⁶⁰ Referente aos custos variáveis, que não considera os custos fixos de conservação nem o custo de investimento.

¹⁶¹ Volumes brutos que são captados, e não aos volumes líquidos efetivamente utilizados. Não contabiliza os volumes que retornam ao meio hídrico (20% evaporada, 10% transpirada pelas plantas, 10% retida no solo e infiltrada. Os restantes 60% é retido nas plantas)

captado e não o volume líquido efetivamente utilizado, sem os volumes que retornam ao meio hídrico: 20% de água evaporada, 10% de água transpirada pelas plantas, 10% de água retida no solo e infiltrada. Os restantes 60% correspondem efetivamente à água retida nas plantas.

Para uma noção de disponibilidade de água, se compararmos o volume de água utilizada com as afluências anuais (47.840 hm³), Portugal utiliza uma pequena parte das disponibilidades hídricas anuais (somente 9% do total), o que significa que a agricultura utiliza apenas 7% (3.390 hm³) das disponibilidades hídricas anuais nacionais (AR, 2016).

Se às afluências superficiais acrescentarmos ainda a disponibilidade de água subterrânea (que reflete a capacidade de recarga natural dessas massas de água), aos valores acima referidos, acrescem 7.908 hm³.

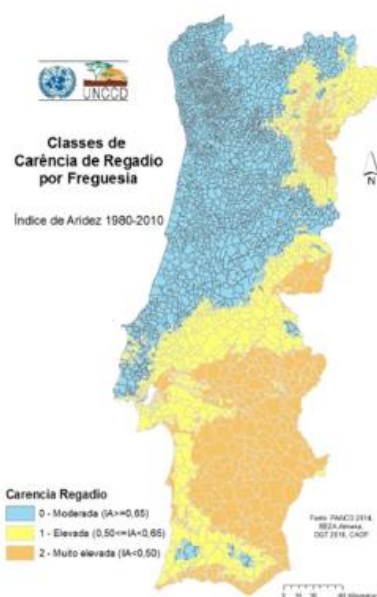
Efetivamente Portugal possui um volume de recursos hídricos abundante de águas superficiais e subterrâneas que está muito longe de ser utilizado na sua plenitude. Existe uma desajustada “recarga” dessas capacidades (através da precipitação), quer em termos regionais (chove mais no norte do que no sul), quer em termos temporais (chove no inverno e no verão a chuva é quase nula). Ao mesmo tempo, Portugal tem reduzida capacidade para armazenar água, Portugal tem capacidade para reter apenas 20% da água disponível (afluências médias anuais). Por outro lado, o País não dispõe de uma “rede hídrica” que permita, em cada momento, disponibilizar a água (para diversos fins) nos locais e nos volumes em que ela é necessária.

Também a questão da disponibilidade de água é intrínseca à sua qualidade: menor quantidade, maiores problemas de qualidade das massas de água e no atingir das metas da DQA. De acordo com o Relatório de Estado do Ambiente de 2018 (APA, 2018), apenas 53% das massas de águas superficiais e 75% das subterrâneas possuíam bom estado global. É importante referir que se desconhece, por falta de monitorização, o estado químico de grande parte das massas de água superficiais o que explica em parte a classificação de estado global inferior a bom, atribuída a massas de água superficiais (47%) (GPP, 2020). Esta questão é bastante relevante uma vez que é ao setor que é atribuída a maior responsabilidade pelas pressões.

- **Falta de resiliência das explorações agrícolas ao clima mediterrânico e ao efeito das alterações climáticas**

Mais de metade do território, no período entre 1980 e 2010, apresentava já “carência” de água significativa (elevada e muito elevada), com a precipitação a não ser suficiente para cobrir pelo menos 65% das necessidades, como mostra o mapa da figura 3.

FIGURA 3: MAPA ÍNDICE CARÊNCIA REGADIO

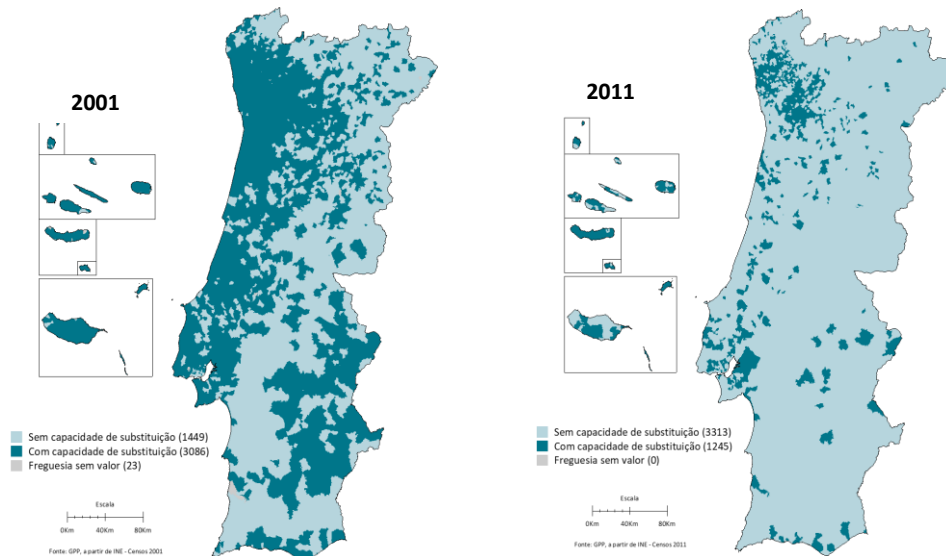


Fonte: ICNF, 2017.

- **Não renovação geracional no sector agrícola e nas zonas rurais**

Perceber a dinâmica das populações é outro fator importante no conhecimento das fragilidades do nosso território. Consta-se o forte envelhecimento da população portuguesa em particular nas áreas rurais. As regiões do interior têm cinco vezes mais velhos que jovens. A saída da população que se acentua das freguesias rurais, quer para o litoral quer para as cidades intermédias, associado ao envelhecimento da população, cria uma situação crítica de incapacidade de substituição geracional na grande maioria do Continente, como mostra a figura 4. Esta marcada tendência caracteriza as zonas rurais sendo promotora de condições que favorecem o risco de abandono dos territórios, perda de produtividade, de biodiversidade, com todas as implicações que daí decorrem a nível económico, ambiental e social.

FIGURA 2: SUBSTITUIÇÃO E GERAÇÕES EM IDADE ATIVA, 2001 E 2011



Fonte: GPP, 2018.

- **Agravamento do problema da coesão territorial**

Assistimos a uma “litoralização” progressiva do país, acentuando-se a tendência para o despovoamento, envelhecimento e empobrecimento das regiões do interior, as quais representam cerca de 2/3 do território nacional. A perda de coesão territorial e social nestes territórios tem vindo a agravar-se, e convoca-nos para a procura urgente de soluções que contrariem uma trajetória insustentável. Com esse desígnio foi pensado o Programa Nacional para a Coesão Territorial (Governo X. , 2017) que prevê a implementação do Programa Nacional de Regadios até 2023 (Governo X. , 2019) mas não previne uma solução para o problema estrutural de pontos estratégicos de falta de armazenamento de água para responder ao impacto das secas e das alterações climáticas.

- **Hostil opinião pública por desconhecimento do que é a agricultura, nomeadamente de regadio**

A urbanização da população afastou-nos do conhecimento da agricultura e do seu papel como cuidadores do território. Os incêndios e a recente crise Covid fez realçar a importância da agricultura no fornecimento de alimentos, na estrutura da nossa economia e dos nossos “territórios”. Mas a verdade é: há que lembrar com alguma regularidade essa importância e desmistificar ideias e conceitos infundados sobre as práticas agrícolas atuais no meio ambiente.

O recente movimento das hortas urbanas, que tem vindo a recolher mais seguidores, pode ajudar a sociedade (cada vez mais urbanizada) a perceber a realidade da produção agrícola, da sua diversidade e o papel de coesão para o futuro do nosso território.

- **Redução da representatividade política do mundo rural e da agricultura**

Com a tendência de abandono das regiões do interior e da atividade agrícola, o interior vai ser ainda menos representativo e vai ser cada vez mais difícil fazer valer a importância da agricultura, do interior e das zonas rurais.

Em Portugal, 6 círculos eleitorais (Lisboa, Porto, Braga, Setúbal, Aveiro e Leiria) (AR, 2019) elegem 66% do Parlamento, 151 dos 230 deputados. Os distritos com maior peso na composição da Assembleia da República são os do litoral e dos grandes centros urbanos. Os distritos do interior e zonas rurais elegem apenas 10% do Parlamento. Também é notória a diferença entre a representatividade do norte e do sul, onde a escassez de água e as secas têm maior impacto.

O conjunto destes fatores e a tendência futura são evidências chave que apontam para a **principal extensão do problema que pode conduzir ao desaparecimento do sector primário e à dependência total externa de alimentos.**

4. INFORMAÇÃO DE CONTEXTO

- **Análise dos investimentos dos Programas de Desenvolvimento Rural, atual e anterior**

No anterior período de programação de desenvolvimento rural, PRODER-2007-2013, de 6 mil milhões de euros, o investimento no regadio representou 9% (540 milhões de euros) do quadro de programação e 58% deste foi direcionado para Alqueva (PRODER, 2014).

No atual período de programação, PDR2020, ainda a decorrer, o investimento total é de 4.300 milhões de euros (menos 28% que o anterior) e o regadio tem um peso de 8% (365 milhões de euros, menos 32% que o anterior). Neste quadro, 59% do investimento em regadio foi direcionado para a reabilitação e modernização do regadio existente. Parte destas verbas (267 milhões de euros) integraram o Programa Nacional de Regadios (PNR) 2018-2023 (Governo X. , 2019) e foram complementadas com financiamento do Banco Europeu de Investimentos (BEI) (187 milhões de euros) e do Banco de Desenvolvimento do Conselho da Europa (CEB) (80 milhões de euros).

À concretização do PNR estão assim afetos um total de 560 milhões de euros, com a seguinte distribuição regional: 58% no Alentejo, 23% no Litoral Norte e Centro, 15% no Interior Norte e Centro e 6% no Algarve e deverá materializar-se na modernização de cerca de 41.053 ha de regadios já existentes e em cerca de 55.332 ha de nova área de regadio. Realce-se que, 95% desta área se localiza na região do Alentejo e consiste na construção da 2ª Fase do Empreendimento de Fins Múltiplos de Alqueva.

Na evolução das áreas equipadas para rega, o Alentejo foi a única região em que não houve redução de áreas de regadio. O investimento nas restantes regiões não foi suficiente para travar o abandono das áreas de regadio: em menos de 30 anos perdemos 327.844 ha de área equipada para rega (-38%), o equivalente a 2,7 vezes a área que construímos em Alqueva. Mesmo no Alentejo, o investimento não foi suficiente para impedir a redução do número de explorações agrícolas em 15,5%, entre 2009 e 2016 (-2,4% da SAU) (INE, 2017).

Da análise dos investimentos dos Programas de Desenvolvimento Rural, atual e anterior, a maior parte do investimento em regadio público foi direcionado para Alqueva e o Alentejo foi a única região que não registou abandono das áreas de regadio.

- **Investimento insuficiente nos regadios existentes (a maioria com mais de 50 anos)**

Mais de 50% da área de regadios coletivos públicos foi infraestruturada entre 1938 e 1974. Têm mais de 40 anos e necessitam de intervenção urgente, que garanta melhoria de funcionamento.

O investimento no atual PDR2020 e no anterior PRODER2007-2014, significou apenas 10% das necessidades de reabilitação destas infraestruturas (DGADR, 2014) (PRODER, 2014) (PDR2020, 2020).

- **Construção de novas áreas de regadio coletivo público**

Se compararmos a evolução mais recente, entre 2013 e 2016, perdemos mais de 10 mil ha de área equipada para regadio, de 558.000 ha para 547.837 ha. A infraestruturação de novas áreas de

regadio coletivo não foi suficiente para compensar o decréscimo acentuado nas áreas de regadio individual e travar o abandono do regadio.

Dotar explorações agrícolas com sistemas coletivos de abastecimento de água para regadio, permite maior resiliência e sustentabilidade das explorações. Como é identificado pelo Gabinete de Planeamento, Políticas e Administração Geral (GPP) do Ministério da Agricultura, no diagnóstico do Plano Estratégico da PAC pós 2021 (GPP, 2020), *“a gestão coletiva das infraestruturas facilita a operação das redes, a monitorização da qualidade e quantidade da água utilizada e induz melhorias da qualidade da água e aumento de eficiência na sua utilização”*.

Existe uma necessidade de políticas que permitam manter a diversificação dos sistemas, com os vários tipos de regadio (público privado, coletivo ou individual) e os 2 tipos de agricultura (regadio e sequeiro), para maior flexibilidade das explorações e de culturas.

- **Esforço de investimento para uso eficiente da água na agricultura**

A alteração para sistemas de rega cada vez mais eficientes demonstra a preocupação e consciencialização dos agricultores e um assinalável progresso na eficiência de utilização da água para rega.

Atualmente 75% da área nacional de regadio está equipada com rega sob pressão, dos quais 44% são de rega localizada (GPP, 2020). Estamos próximo dos países líderes em regadio eficiente, como Israel e Espanha.

Entre 2000 e 2009 o nível de “perdas de água” no setor agrícola reduziu de 40% para 37,5% - Programa Nacional para o Uso Eficiente da Água (PNUEA)) (APA, 2016). Estes valores, calculados através da diferença entre os volumes aduzidos ao sistema e os volumes efetivamente utilizados pelos regantes, revelam a melhoria considerável nos níveis de eficiência do uso da água em agricultura. Mais recentemente, o PNUEA estabeleceu a meta de 35% para o nível de perdas de água no setor agrícola. As avaliações mais recentes (APA & DGADR, 2020) indicam que esta meta foi atingida, sendo resultado do esforço contínuo do setor.

- **Falta de investimentos em novos reservatórios**

O Plano Nacional de Barragens de Elevado Potencial Hidroelétrico (PNBEH) constitui-se como a última grande fonte de ponderação de planeamento macro de novas grandes barragens. Dos 10 aproveitamentos hidroelétricos selecionados, foram cancelados 2, Alvito e Girabolhos e adiado 1, o Fridão. No entanto, e tal como o próprio nome indica, o Plano foi concebido numa ótica exclusiva de otimizar a produção de energia, apesar de, nos fatores ponderadores das suas escolhas finais, terem sido igualmente incluídos outras dimensões do seu potencial aproveitamento, entre as quais o seu aproveitamento hidroagrícola.

Atualmente, o contexto mudou substancialmente, por dois motivos essenciais:

1. Desenvolvimento de outras energias renováveis, concretamente da energia fotovoltaica;
2. Maior enfoque nas alterações climáticas e necessidade do planeamento de fins múltiplos que podere a variabilidade climática/hidrológica.

Com base na reflexão suscitada pelo PNBEH, e nos diversos estudos e projetos que foram sendo desenvolvidos em Portugal, quer pelos Ministérios, quer por empresas de engenharia e/ou por reputados técnicos na matéria, foi identificado um conjunto de investimentos estruturantes e prioritários ao nível da regularização das bacias:

- Barragem de Alvito na bacia do Tejo;
- Barragem do Crato/Pisão na bacia do Tejo;
- A “cascata” com barragens nos afluentes da margem direita do Rio Guadiana, culminando na Barragem da Foupana, que poderá constituir-se como um reforço importante do sistema Odeleite/Beliche.

- **Secas com maior intensidade e frequência**

Os dados IPMA, índice PDSI, mostram que desde 2000 já ocorreram cinco períodos de seca e Portugal tem cada vez mais área do território afetada com os mais elevados níveis de intensidade de seca (severa e extrema) (IPMA, 2017).

O estudo publicado pela Agência Europeia do Ambiente (EEA, 2019) alerta que, no futuro, os impactos negativos do clima na agricultura tendem a intensificar-se, com consequências mais graves nos países do Sul da Europa e Mediterrâneo, onde pode ocorrer uma diminuição da produção agrícola ou mesmo o abandono de terras cultivadas.

Todo o território de Portugal está sinalizado na linha da frente das alterações climáticas. Os cenários previstos indicam:

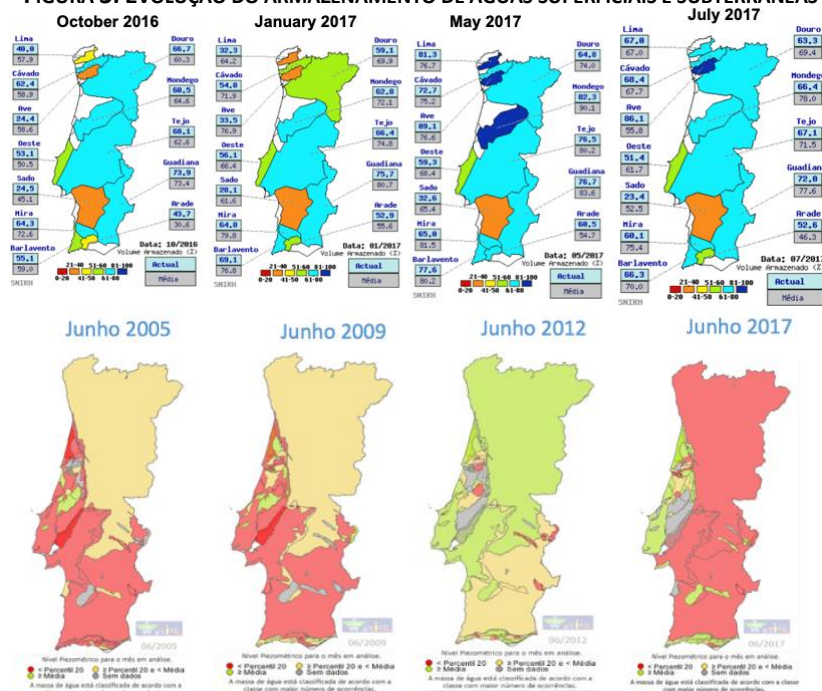
- Um aumento das necessidades de rega para suprir o deficit hídrico crescente;
- Uma diminuição tendencial das afluências às diversas bacias hidrográficas;
- E a uma maior irregularidade intra e inter anual associada a essas afluências.

Aumentar a capacidade de armazenamento de água para responder a este cenário, é vital para Portugal.

- **Níveis de armazenamento de água superficial e subterrânea atingem valores críticos**

O armazenamento superficial por bacia hidrográfica tem vindo a apresentar valores cada vez mais críticos, afetando mesmo as bacias mais excedentárias (SNIRH, 2017). A bacia do Sado apresenta a situação mais grave, como mostra a figura 5.

FIGURA 3: EVOLUÇÃO DO ARMAZENAMENTO DE ÁGUAS SUPERFICIAIS E SUBTERRÂNEAS



Fonte: SNIRH, 2017.

No armazenamento de água subterrânea verifica-se um impacto generalizado com níveis inferiores à média em quase todas as massas de água e algumas a registarem níveis inferiores ao percentil 20 (APA, 2017). Ao longo dos anos hidrológicos, os eventos pluviosos não têm vindo a permitir a recarga eficaz das massas de água subterrâneas, principalmente no sul do País, a região mais afetada com as secas.

Existe uma evidente necessidade de avaliar potenciais ações para promover o aumento do armazenamento superficial e da recarga natural dos aquíferos, num planeamento integrado e realizando as obras necessárias para a sua implementação.

- **Capacidade de armazenamento superficial é de apenas 20% das afluições**

De acordo com o Plano Nacional da Água, Portugal dispõe de uma capacidade que permite armazenar apenas da 20% do total das afluições anuais (AR, 2016), correspondendo os restantes 80% das afluições a água que se “perde”, no sentido que não é armazenada no inverno para poder ser utilizada nos períodos secos. A figura 6 mostra os valores de capacidade útil das albufeiras, por região hidrográfica.

FIGURA 6: CAPACIDADE ÚTIL DAS ALBUFEIRAS POR REGIÃO HIDROGRÁFICA
Capacidade útil das albufeiras (Continente)

Bacia hidrográfica	Afluições anuais (hm ³)	Capacidade útil das albufeiras (hm ³)	Capacidade útil das albufeiras em % das afluições
Lima	3 000	355	12 %
Cávado	2 300	1 142	50 %
Douro	18 500	1 300	7 %
Vouga	2 000	88	4 %
Mondego	3 350	361	11 %
Tejo	12 000	2 355	20 %
Guadiana	4 500	3 244	72 %
Sado	1 460	444	30 %
Mira	330	240	73 %
Ribeiras Algarve	400	230	58 %
<i>Total</i>	47 840	9 759	20 %

Fonte: AR, 2016.

Nas regiões mais a sul, destaca-se a reduzida capacidade de armazenamento existente na bacia hidrográfica do Tejo (20%) e do Sado (30%), face às afluições médias.

No Tejo, refira-se que a capacidade de regularização instalada na parte espanhola da bacia (11.000 hm³) é sensivelmente igual ao valor das afluições em ano médio (APA, 2011). Isto é, Espanha tem capacidade para reter um ano de afluições da bacia do Tejo. Este valor contrasta com os cerca de 20% que se registam na parte portuguesa da bacia do mesmo rio. Refira-se ainda que uma parte das afluições retidas do lado espanhol se destinam a ser transvasadas para a bacia do rio Segura.

Espanha é um exemplo de outros países com o mesmo clima e que são grandes produtores agrícolas, dispondo de uma maior capacidade de armazenamento. O nosso país vizinho tem uma capacidade de armazenamento de água 10 vezes superior a Portugal e não têm 10 vezes mais território nem 10 vezes mais população que Portugal.

Como País de condição de jusante, Portugal tem que prever os problemas da redução de caudais nos rios internacionais. No rio Tejo tem sido evidente o problema da qualidade e da quantidade da água. A Assembleia da República (AR), nas suas diversas recomendações ao Governo (Resoluções AR n.º40/2020 e n.º 63/2020¹⁶²), tem reforçado para que sejam tomadas medidas para defesa da sustentabilidade deste rio, o nosso maior rio da península ibérica. É um problema que Portugal tem de resolver e tomar ação urgente.

5. O QUE ESTÁ A SER FEITO ATUALMENTE EM PORTUGAL PARA ATENDER À ESCASSEZ DE ÁGUA E OS FUTUROS POSSÍVEIS

As medidas implementadas pelo Governo, no sector agrícola, para atender à escassez de água, dividem-se essencialmente em 4 categorias:

1. Investimento na eficiência das infraestruturas de regadio;

¹⁶² <https://dre.pt/web/guest/home/-/dre/137808119/details/maximized>

2. Apoio à prática de regadio eficiente;
3. Fiscalidade;
4. Reutilização (outras fontes).

As medidas 1 e 2 visam a melhoria da gestão do recurso água, através do aumento da eficiência de rega, permitindo uma poupança efetiva no consumo de água. Estas medidas seguem as orientações comunitárias¹⁶³ e são reguladas pelo PDR2020. Em termos de resultados é conseguida uma poupança efetiva de água, no mínimo, entre 5 a 25% mas a vertente de aumento da capacidade de armazenamento de água não é relevante no programa.

O apoio ao **investimento** na eficiência das infraestruturas de regadio é realizado através das Ações “3.2 Investimento na Exploração Agrícola” (826 milhões de euros) e “3.4 Infraestruturas coletivas” (355 milhões de euros). A segunda integra o Programa Nacional de Regadios 2018-2023 e é reforçada pelo BEI e CEB. O total deste programa é de 560 milhões de euros. Para o próximo quadro comunitário de apoio, está em preparação o Programa Nacional de Investimentos 2030 (Governo X. , 2019), que dá seguimento à atual estratégia, com um investimento total previsto de 750 Milhões de euros, distribuídos por dois programas: “Revitalização do regadio existente” (350 milhões de euros) e “Aumento da área regada” (400 milhões de euros). No entanto, no atual quadro de recuperação económico, decorrente dos efeitos da pandemia Covid, desconhece-se ainda de que forma as novas prioridades vão afetar estes investimentos. É preocupante quando nos 10 pontos apresentados no plano de recuperação da economia (Silva, 2020), não se encontra um que aborde a agricultura e de que forma esta será estruturante na produção nacional.

O PDR2020 desenvolve também o **apoio à prática de regadio eficiente** na exploração agrícola, com a ação agroambiental “7.5 Uso eficiente da água na agricultura” (DGADR, 2016), medida que assenta no uso otimizado das tecnologias associadas à gestão da água de rega (inspeção de equipamentos, uso de sondas de humidade, serviços de aconselhamento na gestão da rega e monitorização de consumos). Esta medida, apesar de ter iniciado apenas no atual período de programação, representa já 30% da área de regadio nacional, mostrando a dinâmica que existe no sector e tem vindo a conseguir resultados positivos na eficiência de rega, que importa continuar a desenvolver.

A medida de **fiscalidade** é aplicada através do regime económico e financeiro dos recursos hídricos. A taxa de recursos hídricos (TRH), criada pela Lei da Água e concretizada pelo Decreto-Lei n.º 997/2008, de 11 de junho, como já referido anteriormente, assume-se como um instrumento económico e financeiro essencial para a racionalização do aproveitamento dos recursos hídricos. Uma avaliação direta da sua aplicação e dos seus resultados sobre a escassez de água, não são conhecidos.

A **reutilização**, como uma origem alternativa de água para uso não potável, é uma estratégia que está em desenvolvimento. O quadro legal foi criado recentemente (Decreto-Lei nº 119/2019, de 21 de agosto, e da Portaria nº 266/2019, de 26 de agosto) mas há um conjunto de condicionantes que inibem o seu uso na agricultura: os grandes centros produtores deste tipo de água estão afastados das áreas agrícolas, faltam infraestruturas de armazenamento e de abastecimento desta água, o seu custo é elevado e a agricultura não o pode comportar, há falta de confiança dos consumidores na qualidade das águas residuais tratadas para produzir alimentos e existem riscos associados para as culturas e para o solo.

Estas 4 medidas, juntas, compõem a abordagem atual ou a opção 0 – sem alteração. Nenhuma estrutura em particular gere estes elementos no seu conjunto, mas de facto é esta a estratégia atual.

Todas estas medidas têm expressão significativa no uso eficiente da água mas as fragilidades expostas do nosso território à escassez de água faz levantar a **voz dos especialistas que identificam que o aumento da capacidade de armazenamento de água e de gestão das aflúncias, através de novas infraestruturas, mais do que nunca, faz todo o sentido.** Especialistas como o Eng.º Pedro Serra (Público A. F., 2019), que foi presidente do Instituto da Água, do Instituto Regulador de Água e Resíduos, negociou a convenção luso-espanhola sobre os rios internacionais e está no Comité de Implementação da Convenção da Água das Nações Unidas e o Eng.º Francisco Avillez (Público, 2019), Professor Catedrático Emérito do Instituto Superior de Agronomia, que aconselha os governos desde 2011 como perito para a reforma da PAC, e muitos outros especialistas (Público, 2018).

¹⁶³ Regulamento (UE) no 1310/2013, de 17 de dezembro, Fundo Europeu Agrícola de Desenvolvimento Rural (FEADER).

6. QUADRO DE ANÁLISES E PROJEÇÃO DE RESULTADOS

6.1 Objetivos estratégicos

Tendo por base o diagnóstico efetuado a partir da situação existente, o sistema hierarquizado de **objetivos** e de **metas** que propomos alcançar são:

1. **Diminuir a escassez de água** de forma a assegurar água para a agricultura e para os diversos usos, nos diferentes cenários de alterações climáticas;
2. **Produção sustentável de alimentos e serviços de armazenamento de água**, travando o abandono do sector agrícola e contribuindo para o equilíbrio da balança alimentar;
3. **Desenvolver as economias locais**, contribuindo para o desenvolvimento e coesão territorial.

Para o quadro de análise das opções de política, iremos considerar restrições de custo, de financiamento e de aceitabilidade.

6.2 As opções de política

As 3 opções de política identificadas no desenvolvimento deste estudo são:

Opção 0 – a abordagem atual

Tem por base 4 medidas identificadas - investimento na eficiência das infraestruturas de regadio, apoio à prática de regadio eficiente, fiscalidade e reutilização (outras fontes). O seu conjunto compõe a abordagem atual, que identificamos como a opção 0.

Opção 1 – a estratégia FENAREG

Os 7 eixos de desenvolvimento estratégicos propostos pela FENAREG (figura seguinte), que envolveu as diferentes entidades do setor do regadio, são uma combinação de medidas que, quando tomadas em conjunto, criam uma opção de estratégia ou de política que identificamos neste estudo como a opção 1.

FIGURA 7: ESTRATÉGIA NACIONAL PARA O REGADIO, PROPOSTA PELA FENAREG



Fonte: FENAREG, 2019.

Opção 2 – abordagem alternativa

Outros atores propõem abordagem alternativa, através do restauro dos rios ao seu estado natural, removendo barragens obsoletas, a reutilização de águas na agricultura, a produção em modo biológico, limites às culturas de regadio e a obrigação à manutenção de áreas mínimas da superfície agrícola utilizada afetas a culturas extensivas (GEOTA, 2011). Identificamos a abordagem alternativa como a opção 2.

Para reforço da avaliação das opções, adotamos uma estrutura de análise baseada na combinação de metas e de expectativa de restrições de forma a permitir uma decisão baseada em evidências.

No objetivo **redução da escassez de água**, a abordagem do Governo (opção 0), num prazo de 5 e 10 anos, de acordo com os indicadores atuais responderá às situações identificadas no Tejo/Ocreza e Pisão/Crato, através do aumento do armazenamento de água e desenvolvimento de redes de rega. Também o aumento de eficiência, através do investimento em modernização e reabilitação de infraestruturas e da prática de regadio eficiente, contribuirão, embora em menor escala, para a redução da escassez.

A proposta FENAREG (opção 1), tendo um forte enfoque em medidas para aumentar a capacidade de armazenamento de água e de regularização interanual permitiria dispor, no médio prazo (até 2030), de soluções estudadas e projetadas (incluindo as situações identificadas na opção 0, Tejo/Ocreza e Pisão/Crato) e, no longo prazo (até 2050), concretizar o aumento da capacidade de armazenamento, pelo menos em volume idêntico à redução das aflúências superficiais prevista até 2070 e com ligações de transvase entre as principais bacias hidrográficas para responder às situações mais deficitárias. Os eixos da estratégia proposta pela FENAREG, “*2.Modernizar as infraestruturas públicas de rega*” e “*3.Promover as melhores práticas de rega nas explorações agrícolas*”, alinhados para aumentar a eficiência de rega, com intervenções prioritárias em construções anteriores a 1990 e implementação das melhores práticas de rega nas explorações agrícolas, com aumento da eficiência em 200.000 ha (quase metade da área de regadio nacional), até 2027, contribuiria, no médio e longo prazos, de forma estruturada e relevante para a redução de escassez, além do aumento da vida útil das infraestruturas existentes. A proposta de estratégia inclui também a reutilização, outro dos pontos que contribui redução de escassez.

Na solução alternativa (opção 2), a escassez de água seria agravada no médio prazo com forte impacto a longo prazo devido à remoção de eventuais infraestruturas obsoletas, ao mesmo tempo que não haveria lugar para construir novos sistemas de armazenamento de água, com consequências graves nos territórios, face às alterações climáticas, e aumento das tendências atuais de desertificação e de despovoamento das regiões do interior. O aumento da eficiência também está associado a esta opção, embora o detalhe não permita avaliar o seu impacto no médio e longo prazo. A reutilização de água pela agricultura, sobrepõe-se à proposta da opção 1.

As opções 0 (a abordagem atual) e 1 (a estratégia FENAREG) são as que mais contribuem para a redução da escassez de água, sendo a opção 1, aquela que oferece uma solução a médio e longo prazos mais estruturada e eficaz na redução da escassez de água. O contributo da opção 2 é reduzido para este objetivo.

O objetivo **produção sustentável de alimentos** é contemplado nas 3 opções identificadas. A opção 0 (a abordagem atual) tem um desenvolvimento claro deste objetivo, embora seja a opção 1 (a proposta FENAREG) aquela que direciona o conjunto dos 7 eixos estratégicos à concretização de uma base essencial específica a este objetivo, nos cenários de médio e longo prazos. A abordagem alternativa (opção 2) não permite avaliar de que forma o objetivo da sustentabilidade da produção de alimentos poderá ser atingida, mas as fortes restrições ao regadio impostas por esta opção, significariam, no curto prazo, um agravamento do deficit da balança alimentar e a continuidade da tendência de abandono da atividade agrícola. A opção 2, pelo seu impacto relevante nestes pontos, é aquela que menos contribui para o objetivo de produção sustentável de alimentos.

O terceiro objetivo, **desenvolver as economias locais**, é o mais relevante para o futuro dos territórios rurais e para a coesão. Face ao diagnóstico, a opção 0 (a abordagem atual), manteria as tendências atuais de agravamento da coesão nacional e abandono das zonas rurais. A base fornecida pelos 7 eixos da opção 1 (a proposta FENAREG), assume um papel estruturante para a sustentabilidade das explorações, quer de regadio, quer de sequeiro, pois como vimos, a coexistência das “duas agriculturas” numa mesma exploração agrícola, é realidade em mais de metade das explorações, e a rentabilidade do regadio permite apoiar a manutenção das áreas de produção em sequeiro. A opção 2, a abordagem alternativa, impõe fortes restrições à capacitação das explorações, à sua resiliência e ao desenvolvimento da economia local com base na atividade agrícola.

A opção 1 (a proposta da FENAREG), através dos 7 eixos estratégicos, é aquela que permite, no médio e longo prazos, responder de forma mais significativa, estruturada e eficaz aos 3 objetivos traçados nesta proposta: (1) reduzir a escassez de água de forma a assegurar água para a agricultura e para os diversos usos, nos diferentes cenários de alterações climáticas, (2) promover a produção sustentável de alimentos, travando o abandono do sector agrícola e contribuindo para o equilíbrio da balança alimentar e (3) o desenvolvimento das economias locais, contribuindo para o desenvolvimento e coesão territorial.

Analisemos as 3 opções, face ao **custo e possibilidades de financiamento**, para o horizonte 2027 ou 2030.

Na opção 0 (abordagem atual), o PNI 2030, divulgado pelo Governo no início de 2019, antes do Plano de Recuperação Económica, determinou 750 milhões de euros para investimento em regadio, recorrendo essencialmente ao fundo FEADER.

Para o mesmo período, o levantamento das necessidades associado aos 7 eixos estratégicos da opção 1 (estratégia da Federação), totaliza 1.700 milhões de euros para modernizar o regadio nacional e propõe o alargamento dos instrumentos financeiros a fundos para além do FEADER, articulados numa abordagem multifundos.

Presentemente, face à crise provocada pelo Covid, a Comissão Europeia definiu um plano ambicioso e abrangente para a recuperação europeia - o Plano de Recuperação da Europa. O plano estabelece uma estratégia para relançar a economia europeia, impulsionar as transições ecológica e digital e tornar a economia mais justa, resiliente e sustentável para as gerações futuras, em linha com o European Green Deal. A execução do plano de recuperação exigirá investimentos públicos e privados significativos, que deverão ser apoiados pelo orçamento da UE tendo por base diversos instrumentos de financiamento e que permitirão o reforço de diversos programas, entre eles o PNI 2030. Neste contexto, é oportuno abranger o total de necessidades identificadas (1.700 milhões de euros) para o período até 2030.

A opção 2 (a abordagem alternativa) não dispõe de detalhe conhecido que permita avaliar o seu custo ou a sua comparação face às opções 0 e 1, nem elementos de possível financiamento.

As 3 opções, face à **aceitabilidade**, a abordagem atual (opção 0) tem uma clara vantagem na aceitação por parte do Governo, embora a opção 1 (a estratégia FENAREG), recolhendo um conjunto significativo de contributos dos stakeholders do setor agrícola e de projetos estruturantes para a agricultura, tenha forte peso para ser incluída nas atuais opções do Governo. A oportunidade PEPAC – Plano Estratégico da PAC, sendo o regadio determinante para a agricultura no nosso país, para o desenvolvimento da economia e para a coesão do território, constitui-se inegavelmente como uma das medidas de adaptação às alterações climáticas mais relevantes em matéria de agricultura, tem claramente espaço na estratégia a ser definida para a agricultura portuguesa para os próximos anos. A opção 2 (a abordagem alternativa) tem aceitabilidade dedicada ao modo de produção, pelo enquadramento na Estratégia da Agricultura Biológica (Governo X. , 2017). A aceitação pela opinião pública nas opções 0 e 1, será fraca, por desconhecimento do que é a agricultura no nosso país, e nomeadamente do regadio.

7. A PROPOSTA DE POLÍTICA PARA SEGURANÇA HÍDRICA NA AGRICULTURA

Do diagnóstico efetuado e do quadro de análise do conjunto de opções, a proposta de política a implementar para atingir os objetivos propostos: **diminuir a escassez de água** nos diferentes cenários de alterações climáticas, assegurar a **produção sustentável de alimentos e os serviços de armazenamento de água**, travando o abandono agrícola e contribuindo para o equilíbrio da balança alimentar, com **desenvolvimento das economias locais** para maior coesão territorial, deve conjugar os 7 eixos estratégicos propostos pela FENAREG, tirando partido do conjunto das suas valências.

Como antes foi referido, o país tem identificado um conjunto de ações e de infraestruturas. É tempo de as implementar, assegurando a sua sustentabilidade e resiliência. Nesse sentido e como antes se justificou, aproveitando o caminho que Portugal já vem percorrendo e os objetivos traçados, importa pensar na melhor maneira de manter a agricultura nos nossos territórios e combater as alterações climáticas.

Melhorar a **eficiência hídrica** é um caminho que a agricultura tem demonstrado saber responder. Continua a ser um importante serviço ambiental, investir na otimização das infraestruturas de regadio e também da **energia**, assumindo agora uma fase de evolução mais assente na promoção da

economia circular, com intervenções ao nível da substituição das **fontes de energia convencionais por renováveis** e ações de **eficiência energética**. Ao nível do preço da água é necessário aprofundar as possibilidades de diminuir os fatores de produção relacionados com o uso eficiente, nomeadamente no que respeita a taxas, como as da água (TRH) e dos contratos de eletricidade, como referido, atendendo ao impacto na determinação dos preços da água e a sua repercussão na produção do sector agrícola, nomeadamente na diversidade de opções culturais.

É manifesta a necessidade de **aumentar a capacidade de armazenamento de água e de regularização interanual**. Sendo Portugal um país especialmente sujeito ao risco de aumento da escassez de água, sobretudo num contexto de alterações climáticas e em que depende de forma significativa dos recursos hídricos dos rios transfronteiriços, é fundamental gerirmos cada vez melhor as bacias hidrográficas e os recursos de que dispomos, implementando soluções de armazenamento que assegurem a **redução dos riscos** decorrentes de fenómenos extremos. Tendo em conta a frágil capacidade atual de armazenamento de apenas 20% das afluências, é importante explorar todas as opções para ultrapassar este problema, incluindo os **serviços de armazenamento de água** e o estudo de uma **rede hídrica nacional** que ligue as diferentes bacias hidrográficas. Este estudo deve analisar a relação custo/benefício e identificar as condições que minimizem os impactos ambientais.

Nesse sentido, prosseguindo o objetivo de alcançar uma maior segurança hídrica para a agricultura e simultaneamente travar a tendência de abandono desta atividade, contribuindo para o equilíbrio da produção alimentar nacional, é tempo de estabelecer um **Plano Nacional do Regadio** que reúna todas as matérias do regadio e uma visão de longo prazo, nomeadamente a segurança hídrica.

A base da proposta de Plano assenta em 5 medidas essenciais que foram identificadas com este trabalho:

1. Aumentar o armazenamento de água (resposta interanual);
2. Modernizar infraestruturas de rega e criar novas áreas (aumentar eficiência e resiliência);
3. Práticas de rega de precisão (otimizar a gestão);
4. Certificação de áreas de regadio eficiente (sustentabilidade ambiental);
5. Inovação e capacitação.

7.1 Quem envolver, investimento e financiamento

Sem investimento não há ação, importa por isso adequar a proposta deste Plano Nacional de Regadio aos meios financeiros disponíveis. É crucial assumir uma perspetiva de curto prazo e uma de médio/longo prazo, e considerar o papel preponderante de diferentes atores nas diferentes fases.

A curto prazo, o Estado terá um papel decisivo no lançamento do desenvolvimento Plano, promovendo a sua concretização tendo por base uma análise da proposta identificada pelos principais *stakeholders*, através do estudo promovido pela FENAREG que envolveu entidades gestoras dos aproveitamentos hidroagrícolas, organizações de agricultores, administração, especialistas e empresas de projetos.

A médio prazo é necessário assegurar a sua implementação no terreno, tornando o regadio mais sustentável social, ambiental e economicamente mais resiliente, potenciando a digitalização, as valências inovadoras, mais interconectado com as necessidades locais e capaz de competir à escala global com um desenvolvimento tecnológico equipado para fazer a diferença.

No médio/longo prazo teremos, portanto, o papel do Estado na definição de políticas e investimento público, assegurando a orientação do Plano, e o setor privado assumirá (como tem acontecido até agora) o papel crucial como motor de mudança e o investimento na atividade económica.

O levantamento das necessidades 2021-2027, associado aos 7 eixos estratégicos do estudo da Federação, totaliza 1.700 milhões de euros para modernizar o regadio nacional e propõe o alargando dos instrumentos financeiros a fundos para além do FEADER, nomeadamente o FEDER, do Fundo Social Europeu, o Fundo de Coesão, o Fundo Ambiental, empréstimos do Banco Europeu para o Investimento, Orçamento Geral do Estado e privados, articulados numa abordagem multifundos.

O Programa Nacional de Investimentos 2030, divulgado pelo Governo no início de 2019, antes do Plano de Recuperação Económica, estimou 750 milhões de euros para investimento em regadio. O Plano de Recuperação da Europa estabelece uma estratégia para relançar a economia europeia, impulsionar as transições ecológica e digital e tornar a economia mais justa, resiliente e sustentável para as gerações futuras, em linha com o *European Green Deal*. Exigirá investimentos públicos e privados significativos, que deverão ser apoiados pelo orçamento da EU, tendo por base diversos

instrumentos de financiamento e que permitirão o reforço de diversos programas, entre eles o PNI 2030, além de instrumentos inovadores que estimulem o financiamento público e privado. Neste contexto é o momento de tornar eficaz o investimento no total de necessidades identificadas, em 1.700 milhões de euros, para o período 2021-27.

7.2 Recomendações

Existem muitos diagnósticos sobre os vários problemas associados à perda de capacidade produtiva nacional mas o que precisamos agora é definir um caminho e agir antes que seja demasiado tarde. Há um conjunto de medidas estruturais que o Governo tem vindo a implementar na agricultura, em particular, no regadio, que devem ser reforçadas com investimentos múltiplos ao nível de infraestruturas, dos meios tecnológicos, físicos e de recursos humanos, capazes de responder de forma ágil e sustentada aos inúmeros desafios que se colocam.

Em situações de crise económica e social, como a que vivemos, os problemas tendem a agravar-se e é imperioso, no curto e médio prazo, adotar as medidas que podem resolver a situação e que envolvem a construção de novas infraestruturas, a modernização de infraestruturas existentes e de equipamentos, a transformação digital, a capacitação técnica e a investigação. Os investimentos em algumas destas áreas estão previstos através de diferentes Programas e Planos identificados neste documento, sendo essencial garantir a sua conjugação num caminho, definido através de um único instrumento, o Plano Nacional do Regadio.

Para concretização do Plano Nacional do Regadio, recomenda-se o seguinte:

1. Ao Governo, através do Ministério da Agricultura, **crie condições** para a elaboração do Plano Nacional do Regadio;
2. Seja constituído o **Grupo de Trabalho do Regadio**, com **coordenador nomeado** pelo Ministério da Agricultura e que envolva os principais *stakeholders*, nomeadamente, a FENAREG, representante nacional do regadio;
3. Sejam envolvidos os Ministérios com valência nas áreas do **ambiente** e da **energia**;
4. Numa primeira fase, o Grupo de Trabalho, terá a base proposta pelo sector no estudo apresentado pela Federação em 2019: Contributo para o desenvolvimento de uma Estratégia Nacional do Regadio;
5. Seja definido o prazo de 1 ano para apresentação da proposta de Plano Nacional do Regadio, que responda a uma visão de longo prazo para a sustentabilidade da atividade, com forte dinâmica na coesão dos territórios rurais e que estruture as bases do seu financiamento.

AGRADECIMENTOS

Ao Programa LEAP, às equipas Gulbenkian, ICPA e IES pela fantástica experiência que marcou o meu presente e me ajudará na persecução futura dos meus ideais.

Ao meu mentor temático, Tiago Domingos e aos mentores metodológicos, Katarina, Eóin Young, Vladimir Pavlovic e Lucian Ciolan pelos ensinamentos e diretrizes.

Aos guerreiros LEAP, colegas fantásticos e incansáveis na ajuda e trabalho em equipa.

À Direção da FENAREG, pelo desafio e oportunidade de melhorar a minha capacidade na defesa do regadio, através do programa LEAP.

A todas as associações, especialistas, entidades da administração e colegas que contribuíram para este trabalho.

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AVISO LEGAL

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What is the best policy to reduce the ‘un’sustainable use of pesticides in Portugal

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ABSTRACT

Pesticides go hand in hand with modern farming. In fact, farmers face many pressures to use pesticides, but the most important reason is to avoid economic losses and maximize gains. The application of synthetic pesticides to food crops in the European Union exceeds 400,000 tonnes per year, with numerous negative health and environmental effects.

The objective of this article is to explore the potential for introducing an optimal pesticide policy in Portugal. The impact of different policy strategies (regulation, subsidizing, certification), their applicability and impacts among different stakeholders are assessed to support a proposal for the most suitable policy.

A pesticide policy grounded on certification processes (the current one), where consumers have the option to choose food products without pesticides, imposes the choice of using or not pesticides on the producer and excludes vulnerable segments of the population that do not have access to pesticide free food mainly for economic reasons. Pesticide policies grounded on economic incentives (subsidies) to compensate the costs of using expensive pesticide alternatives also leaves the choice to the farmer, that most times adopts an easy to use and less risky option based on pesticide use, even when having the option to receive an economic compensation. The pesticide policy grounded on taxes over pesticides, based on their toxicity (regulation), to compensate pesticide externalities, seems to be the best choice. In this case, food obtained with or without pesticides will have the same price and that will shift farmers towards more sustainable cultivation practices.

Keywords: Taxes, subsidizing, certification, pesticide use, sustainable farming.

JEL classification: Q, Q1, Q18.

RESUMO

O uso de pesticidas anda de mãos dadas com a agricultura moderna. De facto, os agricultores são pressionados para usar pesticidas, principalmente com o objetivo de evitar perdas económicas e

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maximizar produtividades. O uso de pesticidas na agricultura na União Europeia excede as 360,000 toneladas por ano, com inúmeros efeitos negativos na saúde e no ambiente.

O objetivo deste artigo é explorar a possibilidade de introdução de uma melhor política para o uso de pesticidas em Portugal. O impacto de diferentes opções políticas (regulação, subsídios, certificação), a sua aplicabilidade e o impacto em diferentes atores são avaliados para apoiar a definição da política mais adequada.

Uma política baseada em sistemas de certificação (a política atual), em que os consumidores têm a opção de escolher alimentos isentos de pesticidas, coloca a decisão de usar ou não pesticidas no agricultor e exclui os segmentos da população vulneráveis que não têm acesso a estes alimentos pesticidas por razões económicas. As políticas baseadas em incentivos económicos (subsídios) para os custos decorrentes da opção por alternativas ao uso de pesticidas, também coloca a decisão no agricultor, que normalmente opta por uma solução mais fácil e de menor risco, mesmo perante a possibilidade de receber uma compensação financeira. Uma política de uso de pesticidas baseada na introdução de taxas associadas à sua toxicidade (regulação), para compensar externalidades inerentes do seu uso, parece ser a melhor opção. Neste caso, os alimentos com ou sem pesticidas terão o mesmo preço e isso contribuirá para que os agricultores adotem práticas agrícolas mais sustentáveis.

Palavras-chave: Taxas, subsídios, certificação, uso de pesticidas, agricultura sustentável.

Classificação JEL: Q, Q1, Q18.

1. INTRODUCTION

1.1. The 'un'sustainable use of pesticides

Pesticides, intensively used in Europe and throughout the world against pests and diseases on cultivated plants and weeds in agriculture, and therefore related to an increase in farm productivity, severely affect the environment, biodiversity and non-target organisms including human health (Ewald et al., 2015; Hallmann et al., 2017; Sánchez-Bayo and Wyckhuys, 2019). Pesticides are chemical compounds with a component-specific inherent toxicity (Claeys et al., 2011) that causes the contamination of all environmental compartments (air, water and soil) via leaching, run-off or evaporation, affect habitats and contribute to biodiversity loss, including large reductions of insect populations (Ewald et al., 2015; Hallmann et al., 2017; DEFRA, 2019; Sánchez-Bayo and Wyckhuys, 2019) leading to the deterioration of ecosystem services, such as insect-mediated pollination, soil formation and composition, and the provision of clean drinking water. That could pose potential risks to human health (Zhang et al., 2015), while residues in animal feed pose risks to animal health and can enter the food chain (Bjørning-Poulsen et al., 2008). Population studies show that it is quite common to find detectable concentrations of pesticides in the human urine, such as glyphosate (Niemman et al., 2015; Gillezeau et al., 2019). The numerous negative health effects associated with chemical pesticides include dermatological, gastrointestinal, neurological, carcinogenic, respiratory, reproductive, and endocrine effects. Furthermore, high occupational, accidental, or intentional exposure to pesticides can result in hospitalization and death (Nicolopoulou-Stamati et al., 2016).

Agriculture has been criticised for its negative impacts, but the dimension and the focus on pesticides are unique. Moving towards environment-friendly and healthy production systems is thus a strong demand by European citizens and a strong political commitment. However, quantity, quality, and price of agricultural goods produced by European plant production systems are currently heavily dependent on chemical control of pests, diseases, and weeds. Transition to agriculture free from pesticides is a huge challenge that prompts to a complete reassessment of production practices. At the European level, the directive 2009/128/EC has defined the first reduction goals by calling for the reduction of risks and dependency on pesticides.

Despite the existing European and national regulatory restrictions and the fact that the authorisation process is expensive and pushes pesticide prices up, the actual consumption and use of pesticides in the EU has not decreased over the last years, nor has the percentage of food and feed samples in which residues of pesticides exceed maximum regulatory limits - it remains in the vicinity of 5% (Albouy et al., 2016; EFSA, 2019), or the presence of pesticides in aquatic and soil environment that

are commonly found at concentrations well above the regulatory limit, and there is no sign of decrease or the reduction of biodiversity losses due to intensive agricultural production.

1.2. The need to 'call for action' and adopt policies that aim to reduce the 'un'necessary use of pesticides

Therefore, it is urgent to establish policy measures that aim to diminish the use of pesticides in Europe, and, particularly, in Portugal, reducing the risks and impacts of pesticide use on human health and the environment and promoting the adoption of alternative agricultural approaches or techniques. Policy measures may include regulation (prohibition, limitation and/or taxation of pesticides), subsidizing (support to the adoption of agricultural practices that are alternative to pesticide use), or certification (price differentiation based on consumers demand of certified food products).

The overall goal of the present policy study is to support policy makers towards the definition of the most adequate policy measures that might ensure an effective reduction of pesticide use and its impacts on human health, both at consumers and farmers level, and on the environment, in Portugal.

The design and application of a pesticide policy framework should consider (1) the production level - trends in pesticide use (overuse or underuse), farmers' behaviour in face of the introduction of a pesticide tax or similar, indirect effects of pesticide use, (2) alternatives to pesticide use, (3) attitudes towards risk and uncertainty related to pesticides application, and (4) the value of pesticides to consumers (e.g., the willingness to pay (WTP) for lower pesticide use).

The study will point out potential policy strategies and consider their applicability at national level and its impacts among different stakeholders (farmers, pesticide sellers, consumers, environmentalists, decision makers, etc).

2. PESTICIDES: THE BENEFITS AND THE IMPACTS

Pests, diseases, and weeds are the main competitors with humans for agricultural products, particularly when it comes from crops grown under high productivity conditions, causing important losses (Oerke and Dehne, 2004; Savary et al., 2012; Oliveira et al., 2014; Savary et al., 2019). The damage caused by these crop enemies constitutes a major factor in reducing the productivity of many crops, either in the field (preharvest) or later during storage (post-harvest). An average of 35% of potential crop yield is lost to preharvest pests worldwide and post-harvest losses (transport, preprocessing, storage, processing, packaging, marketing, and plate waste) may achieve another 35% (Oerke, 2006; Molden, 2007; Popp et al., 2012), although these estimates present large fluctuations due to a number of factors related to environmental conditions, the plant species being cultivated, the agricultural practices, farmer socioeconomic conditions, and the level of technology used (Oerke and Dehne, 2004; Oliveira et al., 2014).

Since the advent of pesticides, in the middle of the 20th century, they are the most used method to control harmful or unwanted organisms, such as pests, diseases and weeds, in agriculture, but also to control the growth of plants and pests on non-agricultural surfaces. The use of pesticides brings various benefits (mostly economic), particularly for farmers. Pesticides are used to improve or safeguard agricultural yields and the quality of agricultural products. They also minimise labour input, they can limit soil erosion by reducing tillage, and they are also used outside the agricultural sector, for instance to preserve wood (Cooper and Dobson, 2007).

Pesticide defenders usually sustain that plant protection in general and the use of pesticides have an obvious role in meeting the growing demand for food quality and quantity (Strange and Scott, 2005; Popp et al., 2012; Bonner and Alavanja, 2017).

But, because of their intrinsic properties, pesticides have huge negative impacts: they can be harmful to non-target organisms and can have unwanted adverse effects on human health and the environment. Pesticides are linked to a range of serious illnesses and diseases from respiratory problems to cancer. Since the best-selling book *Silent Spring* (1962), from Raquel Carson, about biological magnification, and the impact large spectrum chlorinated hydrocarbon pesticides such as DDT, the concern about pesticide effects is rising.

2.1. Reducing the pesticide use will impact negatively (or positively) at the production level?

Information on the production structure of pesticide use includes trends in pesticide use (overuse or underuse), and the direction and extent farmers' behaviour will change following the introduction of a pesticide tax. In particular, will a pesticide price increase lead to significantly decreased pesticide use?

In the past 70 years the use of pesticides in agriculture has increased dramatically and now amounts to more than 2.5 billion kg per year, with Europe being the leading continent in terms of pesticides sales (Lamichhane et al., 2016). In Portugal, pesticide use per hectare duplicated between 1990 and 2014 (from 3.04 to 6.84 kg/ha), being among the European countries with highest consumption (Fig. 1) (Roser, 2020).

Conventional pesticides (i.e., only pesticides synthesized by the agrochemical companies) offer numerous benefits, essentially related with increased crop yields, improved food safety, human health, and quality of life, and reduced labor, energy use, and environmental degradation (Cooper and Dobson, 2007). At global level estimates indicates that the losses prevented by crop protection more than 400 billion euros (Roser, 2020).

But the use of conventional pesticides led to a range of problems that will end up being paid by the society. A few studies from European countries have estimated the external costs of pesticide use: over 260 and 117 million euros for the United Kingdom and Germany, respectively (Pretty et al., 2001; Waibel et al., 1999). Other external costs of pesticides include a severe decline in the number of birds, butterflies, bees, and several other species, pesticide resistance among pest populations and a high percentage of workers poisoned by pesticides in Europe (about 27% of farmers) (Lamichhane et al., 2016).

2.2. What are the farmers' perspectives?

Farmers use pesticides to avoid economic losses and maximize gains, and once the technique is used, it may be impossible to revert to the previous process, except at a high cost, even when the cost of production employing the new technique eventually rises above that of the old. The reality is that farmers are under pressure to maximise yield because high yields are equated with high profits. Avoiding the use of pesticides, increases the risks and the financial losses that overcome the costs required to purchase pesticides and prevent that from happening (Yan, 2017).

The pesticide user, seller and regulator face risks and different sources of uncertainties. Production uncertainty related to different technological options, as well as many other variables, can affect pesticide use decisions. Technical, economic, and social constraints will have implications for time and intensity of regulation per se but also on the choice of the policy instrument.

Farmers' choices, in terms of crop protection strategies, may consider a set of available plant protection methods (Figure 1) and integrate appropriate measures that discourage the development of populations of harmful organisms and keep the use of plant protection products and other forms of intervention to levels that are economically and ecologically justified and reduce or minimize risks to human health and the environment. These strategies are supported in agroecological principles, that emphasize the growth of a healthy crop with the least possible disruption to agro-ecosystems and encourages natural mechanisms for pest management (Gliessman, 2014; Lamichhane et al., 2016; Altieri, 2018).

FIGURE 1: CROP PROTECTION METHODS ALTERNATIVE TO PESTICIDE USE



Source: Lamichhane et al., 2016; Costa et al., 2019.

Research on the effects of existing active ingredients on the environment and health and its costs/value/risk and a comparison with alternatives to pesticide use (such as biological or biotechnical control – Table 1) enable to introduce differentiated policy measures and trigger the development of effective alternatives and encourage its adoption.

TABLE 1: ALTERNATIVE CROP PROTECTION MEASURES IN APPLE ORCHARDS

Pest/Disease		Alternative control method
Pests	<i>Cydia pomonella</i> (L.)	— disrupting mating — mass capture — granulose virus — <i>Bacillus thuringiensis</i>
	<i>Dysaphis plantaginea</i> Pass <i>Aphis pomi</i> De Geer <i>Eriosoma lanigerum</i> Hausm	— biological control (conservation) — azadiracthin
	<i>Panonychus ulmi</i> (Koch)	— biological control (conservation) — mineral oil
	<i>Quadraspidiotus perniciosus</i> (Comstock)	— biological control (conservation)
	<i>Ceratitis capitata</i> Wiedmann	— biological control (conservation) — mass capture — spinosade or azadiracthin

Diseases	<i>Venturia inaequalis</i> (Cooke) G.Winter <i>Podosphaera leucotricha</i> (Ellis and Everh.) E.S.Salmon	— potassium permanganate — copper and sulphur — argile
	<i>Nectria galigena</i> Strasser	— cultural measures — copper

Source: Author table.

2.3. Should consumers be concerned?

Pesticides have been associated with health issues. The numerous negative health effects that have been associated with chemical pesticides include, among other effects, dermatological, gastrointestinal, neurological, carcinogenic, respiratory, reproductive, and endocrine effects. Furthermore, high occupational, accidental, or intentional exposure to pesticides can result in hospitalization and death (Covello and Merkhoher, 2013; Nicolopoulou-Stamati et al., 2016).

Human exposure to pesticides occurs through various routes (e.g., residues in food and drinking water) and the related hazards range from short-term (e.g., skin and eye irritation, headaches, dizziness, and nausea) to long-term (e.g. Parkinson's disease; asthma; depression and anxiety; attention deficit and hyperactivity disorder (ADHD); and cancer, including leukaemia and non-Hodgkin's lymphoma), being influenced by various factors (e.g., period and level of exposure, and type of pesticide (regarding toxicity and persistence). In fact, it is obvious that there are no groups in the human population that are completely unexposed to pesticides (Kim et al., 2017; PAN-Europe, 2020).

Residues of pesticides can be found in a great variety of everyday foods and beverages. In most cases, the concentrations do not exceed the legislatively determined safe levels (EFSA, 2019). However, these "safe limits" may underestimate the real health risk as in the case of simultaneous exposure to two or more chemical substances, which occurs in real-life conditions and may have synergistic effects, producing unknown adverse health effects (Nicolopoulou-Stamati et al., 2016).

More than ever before, today's consumer exhibits a desire to understand where food comes from and the magnitude and impact of dietary pesticide exposures (Green et al., 2016; Reeves et al., 2019). Stated-preference valuation studies have been carried out to assess consumers' willingness to pay (WTP) for the reduction in human health risks resulting from the application of pesticides (Florax et al., 2005; Skevas et al., 2013; Costa and Santos, 2016), to select the optimal level of health safety and set proper policies that incentive to farmers to switch to more environmental friendly forms of production avoiding pesticides.

Information on the riskiness of pesticides in relation to output realization may enhance the effectiveness of pesticide policy tools while evidence on the consumers' WTP for reducing pesticide-adverse effects can reveal if there is a demand for more environmental friendly products. So, policy makers may use this information by providing an incentive to farmers to switch to more environmental friendly forms of production (e.g., organic or Integrated Pest Management (IPM)).

3. WHAT ARE THE KEY EVIDENCE THAT SUPPORT A NEED TO REDUCE THE USE OF PESTICIDES AND REINVENT THE FOOD SYSTEMS?

Detailed data on the indirect effects of pesticides can assist policy makers in setting proper environmental and health standards that can increase the effectiveness of the different economic instruments. WTP studies can be used to estimate the value of the benefits for human health resulting from the reduction or ban of pesticides through the implementation of different economic incentive-based policies (pesticide tax level, the subsidies or the price-differential in certification policies), providing incentives to farmers to switch to more environmental friendly forms of production. WTP estimates from other countries can be used in EU pesticide policy design (Florax et al., 2005; Skevas et al., 2013).

3.1. The impact of pesticides at the production level

Pesticides are included on variable costs: occur during a single production year and would not be incurred if production was stopped for some reason.

In the United States, the Agricultural Resource Management Survey suggest that, on average, the cost of production for organic apples is 9.5% higher than the costs for conventional production. The primary difference in costs appears to come from labour costs (Taylor and Granatstein, 2013).

Experiences in apple orchards, comparing the use or not of pesticides (using alternative crop protection measures, such as disrupting mating or biological control), shows that the tonnage of apples and growth indicators of apple trees were not adversely affected (Swezey et al., 1998).

Environmental indicators can be used to evaluate the impact on the environment (soil, water, biodiversity) and health (consumer and farmer), for relevant crops/regions, based on the use of different levels of pesticides (from intensive use to non-use).

Monitoring agricultural effects is necessary to ensure that its environmental effects will not threaten consumers, farmers, and environment. Environmental indicators can be used to evaluate the environmental consequences of agricultural activities over time and the relationships with the most sensitive environmental compartments (Galli et al., 2011; OECD, 2001; Primdahl et al., 2010).

To evaluate pesticide effects, we need to consider the impacts related to its use – on biodiversity (living forms and the complexity of relations between species and habitats), on human health, and on the environment (De Smet et al., 2005; Payraudeau and van der Werf, 2005). Environmental indicators are better understood if used and interpreted jointly, therefore the footprint methodology can also provide an assessment using several environmental indicators that complement each other, including economic and social indicators if necessary and possible (Galli et al., 2011). The footprint is, generally, based on the sum of all the relevant indicators related to the system that are scaled using several mathematical options (Borucke et al., 2013).

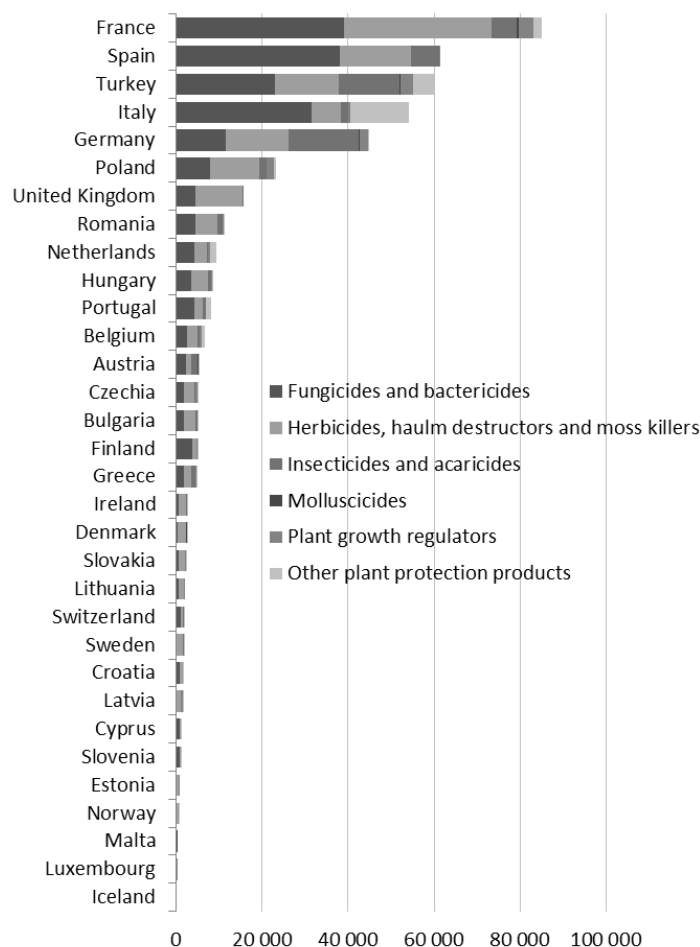
In Portugal, a study was conducted to assess the impact of pesticides in apple orchards, between 2005 and 2007, in different Portuguese regions (Dão and Oeste). Along with simple pesticide use indicators (Environmental impact quotient, EIQ - Kovach et al., 1992 - and Environmental Risk Indicator, e_tox and h_tox – OECD, 2001), a Pesticide print approach was calculated, based on the total amount of pesticides used and its effects on health and environment, including variables related with pesticide use impacts and its main environmental and health effects, sustainable agricultural practices adopted and farmers' knowledge and perceptions towards pesticide risks (Costa, 2016).

The expected pesticide impact, based on the total EIQ and farm worker, consumer, and ecological components and the e_tox and h_tox indicators were significantly higher in integrated pest management and conventional farms, where pesticides are used compared to organic farms (where pesticides were not used). Based on the Pesticide print, that includes variables related with pesticide use, biodiversity, and agricultural practices adopted, farms where pesticides were used presented a significant higher impact on environment and health (the Pesticide Print was 13.7 per ha). This impact is reduced in about 21.7% when farmers do not use pesticides (10.7 per ha).

Based on national statistics (pesticide sales and use), estimations of the potential reduction of pesticide use and its effects on food prices are presented.

In 2018, the total quantity of pesticide sales in the EU-28 amounted to almost 400 000 tonnes. Portugal among the countries in which the highest quantities of pesticides were sold (after France, Spain, Turkey, Italy, Germany, Poland, United Kingdom, Romania, Netherlands, and Hungary) (Eurostat, 2020), and together they made up 81% of the European pesticide sales (Figure 2). Considering the quantities of sold pesticides by utilised agricultural area (UAA), Portugal is also among the countries with higher amounts of pesticide per hectare, with more than 2kg/ha of UAA, which maintain Portugal among the European countries with higher levels of consumption per hectare of UAA (DGAV, 2018). This is due, specially, to the use of fungicides that amount for more than 50% of the pesticides used.

FIGURE 2: PESTICIDE SALES IN EUROPEAN COUNTRIES, BY MAJOR GROUPS, 2018



Source: Tonnes, Eurostat, 2020.

At present almost 46% of the food consumed in Europe contains residues of two or more pesticides, with 4.1% being above the maximum residue levels, according to the annual report published by the European Food Safety Authority (EFSA, 2019). For certain foods, the situation is much worse: more than 60% of the popular summer fruits tested (currants, sweet cherries, strawberries, and bananas) come with pesticide “cocktails”. Furthermore, it is important to highlight the absence of a safety assessment for pesticide mixtures present in our food, which still fails to address the EU law requirements, and puts consumer health at risk in a clear violation of human rights (Pan-Europe, 2019).

There also exists a generalized ignorance about the ‘un’sustainability of pesticide use that is forced by pesticide and seed/plant varieties companies whose productivity depends on intensive use of production factors such as pesticides (Wilson and Tisdell, 2001). Damage to agricultural land from the use of pesticides occurs over a period of time. Hence, costs arising may not initially look serious. Furthermore, farmers do not compensate for the numerous externalities except in the case of production externalities. It is also likely that in the majority of cases, the short-term health effects arising from pesticide use and the disutility from that ill health are underestimated by farmers. As Wilson and Tisdell (2001) demonstrates, when chemical agricultural systems are adopted, agricultural yields or returns become dependent on them despite the very high costs, and thus impose an ‘economic barrier’ to switching to organic systems. The use of chemicals can also affect biological pest control strategies by killing the predators of pests. Hence, even if some farmers decide to adopt biological pest control strategies, they would be affected due to externalities of pesticides arising from neighbouring farms.

From another point of view, agricultural policies in Europe, and in Portugal, should also be appropriate to smallholders and family farmers, the most prevalent form of agriculture in the world (more than 570 million farms in the world), and also in Portugal (93% of the registered farms are classified as family farms; these farmers are of most importance to local food availability, job creation, income and local economy diversification, but also for the preservation of the territories, biodiversity, social and cultural heritage, and constitute the most vulnerable group of farmers specially in terms of risks associated with farming, such as the use of pesticides, fertilizers, equipment, climate, etc. Unfortunately, regulations and laws, research, training, and technology, are not accessible or appropriate to the reality of these farmers.

The European plant protection industry, a significant economic player on the world market, with three of the five largest global companies based in Europe and employing almost 30 thousand people and involving several other companies such as manufacturers of spraying equipment, service companies for aerial spraying, and so on (European Commission, 2007), is a strong player that deeply influence, via advertising and promotion, farmers towards the adoption of pesticides, based on the idea of its effectiveness and cost.

Another issue that systematically challenges the implementation of pesticide regulations and restrictions to its use is the scientific discussion between science, environmental, agriculture and pesticide industry stakeholders. This discussion as led to the establishment of regulations on pesticide registration and distribution that are more demanding and costly to the industry and consequently to farmers.

So, even with the strong epidemiological and toxicological evidence for effects of pesticides on human health, using rigorous criteria and with high probability of a causal relationship, the pesticide industry and farmers organizations defend that these results are not enough to prove causality (Bellanger et al., 2015). Furthermore, these stakeholders, as well as policymakers in most developed countries, argued that pesticides are needed to “ensure” an abundant and affordable food supply for the world and that they are the only cost-effective choice for some crops (Trasande, 2017).

Scientists who raise their voices against pesticides often face criticism from those who have substantial vested interests, loose funding sources, grants, and partnerships, or are refused by many peer-reviewed publications with the adage that “further research is needed” (Bergman et al., 2015). At the same time, several cases of attacks by industry on the scientific credibility, ethics, and personal lives of researchers in this area are known (Aviv, 2014; Sauv  , 2019).

Some authors refer that pesticide-dosing studies are clad in ethical or scientific deficiencies such as “unacceptable informed consent procedures, unmanaged financial conflicts of interest, inadequate statistical power, inappropriate test methods and endpoints, and distorted results” (Lockwood, 2011). In fact, conflicts of interest may lead pesticide companies to generate data favorable to their products, employing different sort of strategies for biasing the research results (Resnik, 2007). Several studies sponsored by pharmaceutical companies tend to favor the companies’ products (Krimsky, 2004; Boone et al., 2014).

Under these circumstances, an important part of the knowledge is not disseminated, contributing to the maintenance of the status quo.

3.2. The impact of pesticides policies at the consumer level

Consumer's choice for environmentally friendlier and healthier products is a complex phenomenon that takes into account individual motives, from quality and healthfulness considerations to collective or social interests, such as a better environment. The factors that influence behavior towards healthier and environmentally friendly products referred to in Table 2 are grouped into two categories: psychological (motivations and perceptions towards health benefits, food safety and environment, knowledge of agricultural practices and certification systems, attitudes towards shopping attributes and agricultural practices and beliefs such as ‘green’ and pro-social ones) and personal (age, gender, family size, education, income and relation urban/rural). Results of these studies revealed to be inconsistent or to have opposite relations with the behavior towards healthier and environmentally friendly products.

TABLE 2: MOTIVATIONS REFERRED IN 60 VALUATION STUDIES FOCUSED ON CONSUMER'S BEHAVIORS AND INTENTIONS TOWARDS BUYING ENVIRONMENTALLY FRIENDLIER AND HEALTHIER PRODUCTS

		positive relation (%)	negative relation (%)	indifferent or little significance (%)
motivations	health benefits	62	2	3
	environment	57	3	
	food safety	28		
	product attributes and purchasing habits	37	2	3
	knowledge of agricultural practices and certification systems	50	2	
	prosocial benefits	17	2	
personal	'green' attitudes	20	2	
	age	33	23	7
	gender ^a	43	8	7
	family size	20	17	3
	education	40	15	7
	income	40	10	5
	urban	12	3	

Source: Costa et al., 2016.

The main motives for consumer's preferences for environmentally friendly products referred to in the studies in Table 2 are health and environmental benefits, knowledge about agricultural practices and quality certification systems and some socioeconomic factors like gender, education, and income.

On the consumers side, it is known that a large part of the population is unaware of the use of pesticides and how different farming systems can contribute to reduce their use and produce safer and environmentally friendlier food (about 60% have little or no knowledge of the use of pesticides in agriculture and have little experience in buying certified food) (Costa et al., 2016). Therefore, the lack of consumers' knowledge and awareness concerning overall food production and processing systems, specifically pesticide issues, emerges as a key issue for policy and marketing strategies.

Costa and Santos (2016) proposed a method to analyse data collected in stated-preference surveys related to the demand for differentiated food products, namely those resulting from the agricultural systems that use less or no pesticides. The method estimates the probability of purchasing the differentiated product as a function of the price premium level, household income, level of consumption of the food item at stake, and knowledge about environmentally friendlier and healthier production systems.

The impact of the optimal price policy on the low-income groups (when compared to a zero-price premium policy) was also analysed. A price policy for the SUP sector that is consistent with the maximization of the gross revenue of the SUP sector will exclude about 80% of the consumers with low income, who will buy SUP at zero price premium, with a substantial increase of their vulnerability to pesticide use risks.

The effect of consumers' knowledge on demand for SUP food also revealed to be very significant. Improving consumers' knowledge and understanding of environmentally friendly farming systems and of the SUP will significantly increase the ability of consumers to make wiser judgments about healthier and safer food.

Consumer awareness of health and environmental safety has led to the design and application of policy tools for the dissemination of sustainable agricultural practices and of rules for the proper use of pesticides. Thereby, since 1979, the European Commission and each individual EU member countries have a long history of controlling pesticide use through a myriad of regulations (Table 3).

TABLE 3: PESTICIDE POLICIES IN DIFFERENT EUROPEAN COUNTRIES

Country	Pesticide policy description	Values for pesticide taxes/fess/levies (euros)
Sweden	Environmental tax per kg of active substances	€3.25 per kg of active substances
Norway	Banded tax system	Basic tax: €2.6 per ha; Per toxicity level - LT: €2.6 per ha; MT: 10.4 per ha; HT: 20.8 per ha ^a
Denmark	Differentiated pesticide tax Overall tax on all pesticides	Insecticides: 54% of retail price (rp) Herbicides/fungicides/growth regulators: 34% of rp Wood preservatives: 3% of gross value
Italy	Sales control, pesticide taxes	0.5% over the final price of domestic pesticides and 1% over imported pesticides
UK	Target fee for registration General fee for industry	Target fee: €5000 General fee: €5719
Switzerland	Direct payments, extra subsidies Minimum ecological standards	
Finland	Registration charge	€840 + 3.5% of final price
Netherlands	Integrated crop protection on certified farms	
France	Pesticide tax	Category 1: € per ton; 2: 381 per ton; 3: 610 per ton; 4: 838 per ton; 5: 1067 per ton; 6: 1372 per ton; 7: 1677 per ton ^b
Germany	Pesticide reduction program	
Belgium	Tax on five active substances	€0,395 per kg

a LT, MT and HT denote low, medium, and high toxicity pesticides, respectively; b Categories reflect different environmental load of pesticides, with 1 being the lowest and 7 the highest toxicity category, based on health and environmental criteria.

Source: Skevas et al., 2013.

The directives 91/414/EC and 98/8/EC on the placing of plant protection products and biocidal products on the market were the first ones dealing with the authorization of pesticides. The waste framework directive (2006/12/EC) and the directive on hazardous waste (91/689/EEC) constitute regulations impacting pesticide use in many ways, as they establish provisions for the safe collection/disposal of empty pesticide packages and unused or expired pesticides. The water framework directive (2000/609/EC) and the regulation on MRLs (396/2005) address pesticide residuals, where the first identifies substances that are hazardous for water (including active substances in plant protection products) and the second sets maximum residue levels of active substances in food and feed.

In Europe, the Directive 2009/128/EC established a framework for Community action to achieve the sustainable use of pesticides, where all farmers should adopt proper agricultural techniques or systems, such as integrated pest management or organic farming, to reduce the use of pesticides and its impacts on the environment and on human health. In Portugal, the Directive was implemented through a National Action Plan (DGAV, 2013, 2018) and a set of national laws, that set a frame of rules for the commercialization and use of pesticides (Law 26/2013, Decree-Law 35/2017 and Decree-Law 86/2010) (Appendice 1).

Since its implementation, the directive has not yielded the expected positive environmental and health impact. In fact, the use of pesticides on average in Europe did not decrease in recent years despite much debate on the sustainability of agriculture and the entering on the market of pesticides that can be used at low dose (PAN-Europe, 2019).

In Portugal, the agro-environmental measures that supported the adoption of integrated pest management (IPM) and organic farming (OF) between 1994 and 2013 have reduced the global impact of the risks associated with the use of pesticides (about 5% when compared with

conventional agriculture) (Costa, 2016). Nevertheless, several studies are referring that in fact farmers have not reduced the use of pesticides and that Portugal is on the top five countries using higher amounts of pesticides per hectares – in 2012 the average pesticide usage per hectare was 3.73 kg (Lamichhane et al., 2016; Costa et al., 2017).

This may lead to the conclusion that pesticide policies (such as the Directive for the sustainable use of pesticides and several other of international legal instruments and conventions), are not enough to ensure that pesticide use and risks are significantly decreasing with its implementation. In fact, the PAN International monitoring report indicate that highly hazardous pesticides are often used and that most farms do not use or have full personal protective equipment, by lack of ability, access or price (Weber, 2011).

The implemented policies are based on training in safe and effective pesticide use, codes of conduct on the distribution and use of pesticides, pesticide registration to make sure that only properly tested and approved pesticides are sold and the application of taxes according to pesticide risk.

A growing number of individuals and organisations no longer believe that training can achieve a so called "safe use" of pesticides, particularly among small-scale farmers who do not have access to enough training and proper equipment (FAO, 2010). Furthermore, it often proves impossible to restrict pesticide use to only those farmers trained in their use.

Some countries have supported programs to promote the adoption of more sustainable agricultural practices. A good example is the ECOPhyto program in France, based on the implementation of a network of thousands of farms that tested methods of reducing chemical use, improved national surveillance of pests and plant diseases, and funded research on technologies and techniques that reduce pesticide use. At the same time, that have imposed taxes on farm chemicals in a bid to decrease sales, and even banned numerous pesticides, infuriating many farmers (Stokstad, 2018). The program failed miserably: instead of declining, national pesticide use has increased by 12%. One major reason for this flop, was because farmers fear burdensome rules and increased costs that will put them at a competitive disadvantage.

Nevertheless, there are several agroecological approaches available to farmers that are alternatives to pesticide use, such as mixing crops, planting new varieties, biological and biotechnical control, etc. These alternatives require technical capacities that are not accessible to all farmers, demanding for appropriate training, but also that are associated with higher risks at farm level (Weber, 2011).

Thus, policy research is needed to understand what are the most suitable policies and measures that will contribute to an effective reduction of pesticide use and the environmental and health impacts that come with its use.

Besides the exclusion of toxic pesticides, a set of rules should be established, either by defining restrictions to the amount or to the number of treatments of each pesticide, by associating taxes to the most dangerous pesticides (pesticides that cause endocrine disrupting effects that are toxic to natural enemies and other living organisms, and for which there is evidence of causing other health problems), by supporting farmers who reduce pesticide use (creating incentives for the adoption of sustainable options that should deliver effective benefits, including limits to pesticide use), or by the development of information campaigns that increase consumers' awareness about health and environmental risks associated with pesticide use.

In fact, as policy tools have impact on food prices, incentives to farmers (e.g., agri-environment schemes), if appropriately designed, including selling price commitments, may deliver safer but not necessarily more expensive food, as costs will be supported by taxpayers. Regulation (e.g., pesticide withdrawal or taxes), as well as pesticide taxes will impose safer but more expensive food. Market differentiation will ensure that consumers have a choice between cheaper, but less safe food, and more expensive, but safer food, which would be justified only if income distribution was more equitable, and everybody could opt for the safer food (Costa and Santos, 2016).

To design balanced strategies to promote farming systems that use less or no pesticides, policy makers need to understand the effects of different policies based on certification, taxes, or regulation. It is also necessary to understand the mechanisms that keep the usage high (easy, riskless, and cheaper way to go from the farmers perspective, lack of technical alternatives, profits from the perspective of the pesticide industry, political arrangements between groups of stakeholders, scientific gaps, and misuse of the available knowledge) and to identify the triggers that might break the underlying logic.

The design of optimal pesticide policies requires insight into the relationships between production decisions on crop yields and their quality, the environmental and health spill over impacts of

pesticide use, how consumers address the issue of pesticide risks and how policies and regulations influence production decision making.

4. UNDERSTAND WHY THE CURRENT PESTICIDE POLICY NEEDS TO CHANGE

The health and environmental impact of pesticide use has been demonstrated to be 'un'sustainable both in the short and long term.

As a first issue to address, pesticides used have acute and chronic effects on farmers and consumers health and on the environment (groundwater, soil and air and air pollution and non-target organisms' secondary effects - birds, insects, fishes, among others). As there are no policy instruments that determine a compensation of these effects, the users (farmers) may keep using pesticides without having the need to choose the less harmless or alternatives to its use, choosing normally pesticides based on economic or efficiency reasons, without considering effects on humans (consumers and farmers) and the environment. Also, the damages caused (health, pollution) are paid by taxpayers, and a user-payer mechanism is not in place as it happens in other fields (tobacco, industry pollution, CO2 emissions, etc).

Pesticide policies grounded on certification processes that ensure consumers choice for food products without pesticides (the current situation, as there are no pesticide taxes neither subsidies to compensate the use of alternatives to pesticides or not to use them), result on higher food prices, due to the costs of certification, and the costs of adopting alternatives to pesticide use, or to lower productivities due to the no use of pesticides. In this situation, a significant part of the population does not have the economic capacity to buy food without pesticides, making them more exposed to health problems related with pesticide use, specially, people with low levels of income, usually more exposed to unbalanced diets. Such situation, together with the fact that a large part of the population doesn't have enough knowledge about pesticide risks, will increase of the health problems related with pesticide residues in the food, water, and the environment, specially among people with less resources that are per se more susceptible due to inadequate diets, higher risks of health problems and less access to health care.

The previews to issues are related with human health and environment values, that are, nowadays, a major concern of the society and should be the first issues to be considered in pesticide policy design.

On the production side, producers with less levels of education or training, or with limited access to alternative solutions (for economic, social, or technical reasons) do not have the incentive to find alternative and more exigent pest control solutions because the use of pesticide is the easier and less expensive solution. These farmers keep using pesticides, impacting on their health, food products and the environment and even when facing these problems, do not have the energy and critical and technical capacity to adopt the alternatives.

Also, there are no specific rules setting limits to pesticide use per crop, year, area, or penalties for farmers that abuse on pesticide use without justification, or to the use of pesticides based on toxicity effects. Because of that, pesticide users (farmers) may use whatever amount of pesticides they want, without having the need to justify its use. The official controls to pesticide use are only based on field books auditing, that is mandatory, but only reflects the farmers' statement about the list of pesticides used per year, without a proper justification for each treatment – the risk assessment is not required - allowing an uncontrolled use of pesticides. Pesticides are also monitored by a national food sample, that reaches only a small part of the total number of farmers.

5. WHAT ARE THE PESTICIDE POLICY OPTIONS AT STAKE?

Pesticide policies grounded on economic incentives should include taxes (or subsidies) to control pesticide externalities, where the tax (or subsidy) reflects the marginal net damage (benefit) of pesticide use. The problem with such a policy framework is that obtaining an accurate estimate of the monetary value of pesticide damage (or benefit) is not an easy task mainly because of prohibitive information requirements (Skevas et al., 2013). Alternatively, a set of standards or targets for environmental quality followed by the design of a regulatory system that could employ taxes (or subsidies) to attain these standards may constitute the policy design.

A pesticide policy framework that combines market-based instruments with standards for acceptable environmental and health quality will enable policy makers to base the charge rates or prices on the acceptability standards rather than on the unknown value of marginal net damages (Pretty et al., 2001; Skevas et al., 2013).

The design and application of a pesticide policy framework grounded on market-based instruments and environmental and/or health standards, requires rigorous information on different dimensions and aspects of pesticide use. The elements needed by policy makers to apply such a policy framework may be summarized by information on (1) the production structure (i.e., production function, pesticide demand elasticities), (2) attitudes towards risk and uncertainty related to pesticides application, (3) the value of pesticides to consumers (e.g., the willingness to pay (WTP) for lower pesticide use), and (4) the indirect effects of pesticide use (Skevas et al., 2013).

5.1. Analysis of different policy options

Possible policies (Table 4).

1. Pesticide policy grounded on taxes over pesticides, based on their toxicity, to compensate pesticide externalities, reflecting the marginal net damage of pesticide use on health and the environment
2. Pesticide policies grounded on economic incentives (subsidies) to compensate the costs of using expensive pesticide alternatives, where the subsidy reflects the marginal net benefit of reducing pesticide use
3. Pesticide policies grounded on certification processes that ensure consumers choice for food products without pesticides (the actual policy)

TABLE 4: PESTICIDE POLICIES AND ITS GOALS AND CRITERIA FOR IMPACT ASSESSMENT

	Policy Options		
	1	2	3
Goals/criteria	Pesticide policy grounded on taxes over pesticides, based on their toxicity, to compensate pesticide externalities, reflecting the marginal net damage of pesticide use on health and the environment	Pesticide policies grounded on economic incentives (subsidies) to compensate the costs of using expensive pesticide alternatives, where the subsidy reflects the marginal net benefit of reducing pesticide use	Pesticide policies grounded on certification processes that ensure consumers choice for food products without pesticides (the actual policy)
Reduce de use of pesticides	10% to 20% (the pesticides with higher level of toxicity) (a)	More than 50% (based on data from countries where food price is not constraining preferences) (b)	Up to 50% (based on an increase of 7% of the organic area per year) (b)
Reduce pesticide use per hectare	Less than 2,24 kg/ha (c)	Less than 1,14 kg/ha (c)	between 1,36 and 1,14 kg/ha (c)
Increase food costs	10% to 20% due to pesticide costs	Similar	30% due to certification and pest protection alternative costs
Lack of alternatives to pesticide use	No risk	Higher	Higher
Shift consumption towards less harmful pesticides	High increase, due to pesticide costs	Medium increase, due to market demand and pesticide free food	Lower increase, due to market demand and pesticide free

		competition	food competition
Reduce diseases related with pesticide use	Lower	Higher	Medium
Consumption of safe food on the (vulnerable) segments of the population	Between 20% to 50% of consumers (the effect is higher in low-income groups) (d)	More than 70% of consumers (prices between conventional food and pesticide free food will remain equal) (d)	Between 20% to 50% of consumers (the effect is higher in low-income groups) (d)
Protect (increase) biodiversity	Lower increase of biodiversity	Higher increase of biodiversity	Medium increase of biodiversity
Decrease pesticide residues in food and water	10 to 20%	More than 50%	Up to 50%

a) Based on results of similar policies on Sweden, Denmark and Belgium; b) Pedersen et al., 2012; IFOAM, 2020; c) Average usage of pesticides per hectare in Portugal (2,78 kg/ha) towards 1,14 kg ha in Austria, where 50% of the agricultural area is organic (EEA, 2018); d) Costa and Santos, 2016.

Source: Author table.

5.2. Policy alternatives that should not be considered

“Pesticide policies grounded on certification processes that ensure consumers choice for food products without pesticides (the actual policy)”

Policies that promote market differentiation of pesticide free food products, where higher-cost food commands a price premium. Consumers will have a choice between cheaper, but less safe food, and more expensive, but safer, food. The preference for this food products depends on the consumer knowledge, willingness and economic capacity of choosing these food products, and the production will be restricted to a niche of the market.

This kind of policies, where consumers (and farmers) are free to choose between consuming food free of (or using) pesticides, are more appealing in democratic societies and consumers seemed to be attracted and ready to believe in the underlying warranties. Unfortunately, these policies will lead to:

- Producer would choose the less risky and less expensive options (pesticide ones'), that are also easy to adopt;
- Consumers usually choose based on price;
- Vulnerable segments of the population usually do not have access to pesticide free food product (for economic and knowledge reasons).

A shift toward the consumption of pesticide free food products is only possible based on efficient and customized strategies of information and environmental and health education, as well as specific quality promotion and distribution strategies. Also, without appropriate price policies based on market differentiation will exclude low income and uninformed consumers (and farmers) with a substantial increase of their vulnerability to pesticide use risks. Furthermore, the costs of health care related to pesticide use impacts will be supported by taxpayers.

“Pesticide policies grounded on economic incentives (subsidies) to compensate the costs of using expensive pesticide alternatives, where the subsidy reflects the marginal net benefit of reducing pesticide use”

Policy tools based on economic incentives to pay the costs of using expensive alternatives to pesticide use or for the environmental services due to the non-use of pesticides - agri-environment schemes, adoption of alternatives to pesticide use or agroecology practices recognition, or other forms - may deliver safer but not necessarily more expensive food with costs being incurred by general taxpayers.

This kind of policies, where farmers are the responsible for choosing the most suitable crop protection scheme have proved to work properly when economic incentives are in place. Consuming between food free of pesticides will be an option for the consumers, as food products would have similar prices between conventional and pesticide free food products. The success of these policies depends on:

- Farmers technical capacity to find and adopt alternatives to pesticide use, usually with higher risk levels and higher level of technical complexity;
- Consumers will have the possibility to choose based on quality, at that would need an investment on education and information, so that consumers may recognize the benefits of food free from pesticides in opposition to size, aspect, colour, etc.

The effect of consumers' knowledge on demand for pesticide free food is very significant, and thus improving consumers' knowledge and understanding of environmentally friendly farming systems will significantly increase the ability of consumers to make wiser judgments about healthier and safer food.

5.3. Why the “Pesticide policy grounded on taxes over pesticides” is the best one

“Pesticide policy grounded on taxes over pesticides, based on their toxicity, to compensate pesticide externalities, reflecting the marginal net damage of pesticide use on health and the environment”

With pesticide policy grounded on taxes over pesticides - regulation (pesticide withdrawal) - consumers can obtain with or without pesticides at the same price. Pesticides taxes are imposed per kg of active ingredient, and can be established on the sales value, dosage, weight of active ingredient or the environmental impact of a product. The tax rate can be fixed or differentiated among product classes or toxic content; it can be set as a fixed amount or as a percentage. From a revenue generation standpoint, a single, uniform ad valorem tax is the simplest solution and with low administration costs. From an economic perspective, a differentiated tax that takes account of the environmental damage caused by different types of pesticides is the preferred solution, since it provides more targeted price signals to the market and more adequately reflects marginal damages. Obtaining an accurate estimate of the negative externalities produced using pesticides/fertilizers is not simple and requires evidence-based research. In fact, there is a trade-off between maximizing revenues with a simple and uniform tax against more complex but differentiated rates based on the toxic content, which are more effective from an environmental standpoint.

This kind of policies, where farmers are the responsible for choosing the pesticides based on their personal beliefs, judgment, and economic interests, have pros and cons:

- It is a relatively easy tax to collect and administer when a simple design is chosen. directly address market failures by incorporating the social and environmental cost of using pesticides/fertilizers.
- Provide an incentive to shift farmers and commercial agriculture enterprises towards more sustainable cultivation practices.
- May increase food product costs, if farmers continue to use pesticides; but food products based on agroecological practices, such as organic food, will be at the same prices.

This policy option would be the easiest to implement, putting all responsibility and decision over the farmer. If the taxes will be high enough, naturally we could expect that farmers will look for cheaper solutions, choosing pesticides only when no other solution exists (philosophy under the concept of integrated pest management). If it also imposes a limit to the total number or amount of pesticides per hectare, it will become mandatory to farmers to adopt global decision-making processes based on low levels of pesticides. Restricting the quantities of pesticide used in fruits and vegetables might cause yields to decrease to a significant extent in the absence of low toxicity alternatives.

Nevertheless, farmers would be able to still use pesticides, and that would probably increase the price of food products due to the high cost of pesticides or the cost of the penalties paid due to the overuse of them. The low-price elasticity of demand suggests that without high rates there will be only minor effects in pesticide use reduction.

The main reason against this kind of policy, is that consumers with low levels of income will be severely jeopardized, as the global food basket cost would increase. Also, the tax on pesticides may be too high for poor and small farmers, specially family farmers (more than 85% of the Portuguese farmers).

At the same time, other risk to consider will be the possibility that several mechanisms and big company policies can be put in place to neutralize these effects, the existence of conflicting interests can create tensions among agricultural producers, agribusinesses, pesticides producers and consumers, tax evasion that can reduce the amount of resources mobilized.

Probably, an option that merges Policy option 1 and 2, based on the transfer of the taxes over pesticides to subsidize farmers that adopt alternatives to pesticide use, will be the best. In fact, it would allow generating a double dividend if the resources mobilized are used to reduce distorting forms of taxation or if they are reinvested in organic agriculture or other sustainable agriculture practices.

6. CONCLUSION AND RECOMMENDATIONS

The proposed research will contribute to the discussion of policy measures that aim to achieve a reduction in the use of pesticides, giving evidence to support the choice of the most adequate one.

The timing of the study is relevant, as Europe is preparing a long-term planning for the 2021-27 Common Agricultural Policy and Portugal should set up its national rules and programs to fulfil its objectives. Furthermore, society is increasingly concerned with food safety, health, and environmental issues demanding solutions that ensure their welfare and the future of the next generations.

Our recommendation is that a pesticide policy grounded on taxes over pesticides, based on their toxicity, to compensate pesticide externalities, reflecting the marginal net damage of pesticide use on health and the environment should be implemented.

A key message, strong and assertive should be considered since the beginning of the advocacy plan implementation:

- We need to have **healthy and safe food**. We need to **safe our agricultural landscape and patrimony**;
- So, we have to **discuss and create the opportunities to change our approach to the food system, renewing it without pesticides**;
- If nothing else, **decades of organic farming and age-old agroecological knowledge** show this transformation is possible.

The main actors to involve are:

- Consumers and health professionals that have, nowadays, a major influence in the consuming processes, specially due to the current knowledge about the influence of the human diet on its health, specially in diseases, such as cancer, obesity, dementia, among others. The increasing demand for organic and safe food legitimates the role and importance of these stakeholders.

- Environmental non governmental organizations (NGOs) are familiar with the discussion, have their one channel that can be used to promote the debate and are willing to have research evidence-based to support their activities. They will have a full comprehension of the problem and are used to set similar actions
- Farmers are the real promoters of the proposed changes. Successful examples are the stronger voices to convince other farmers that might not trust the alternatives. They are also the ones that take the risks.
- Journalists and media players can raise our voices to achieve wider publics and reach policy makers, moving them towards the necessary changes

In parallel, it is relevant to get media support (national television and radio, newspapers), promoting debates involving journalists, scientists, consumers, farmers, and deputies from different political spectrums, and also to involve the international stakeholders, that have experience and a voice in similar campaigns.

Food, industry and industrial farmers lobbies are the strongest one's in the sector and will oppose to any recommendation that influence agricultural productivity and returns. Their involvement is mandatory, despite the result.

Deputies are crucial to ensure the debate occurs in the parliament and to defend our recommendations. Some groups defend political agendas that in some cases have goals that are common with the proposed changes, namely the green party, the left party, and other that are more concerned with environmental issues. Discussions in the sectorial commissions and in the plenary will contribute deeply and are necessary to promote the approval of any recommendations. An effort should be considered, to find the necessary support so that policy recommendations are presented and discussed in the parliament, via governmental departments, parliamentary deputies or civil society movements (petition to parliament).

Policies and programs to support any activity in the agricultural sector are designed by governmental departments¹⁶⁵. Discuss, agree and consensus on the right proposal/ recommendations should be a target looking forward to obtaining an agreement to introduce the debate on the governmental agenda.

APPENDICE 1: POLICY TOOLS FOR THE DISSEMINATION OF SUSTAINABLE AGRICULTURAL PRACTICES AND OF RULES FOR THE PROPER USE OF PESTICIDES

Year	Policy/Regulation	Aim
Europe		
1979	Council Directive 79/409/EEC	conservation of wild birds
1991 and 1998	Directives 91/414/EC and 98/8/EC	authorization and placing of plant protection products and biocidal products on the market
1991 and 2006	Directive on hazardous waste (91/689/EEC) and Waste framework directive (2006/12/EC)	regulating the impacts of pesticide use in many ways and establish provisions for the safe collection/disposal of empty pesticide packages and unused or expired pesticides
2000	Water framework directive (2000/609/EC)	addressing pesticide residuals and identifying substances that are hazardous for water (including active substances in plant protection products)
1991	Directive 91/414/EC	Thematic Strategy on the Sustainable Use of Pesticides
2005	Regulation on MRLs (396/2005)	maximum residue levels of active substances in food and feed
2009	Regulation No. 1107/2009	placing of plant protection products on the market
2009	Directive No. 2009/128/EC	sustainable use of pesticides

¹⁶⁵ Office of Planning, Policy and General Administration (GPP - Gabinete de Planeamento, Políticas e Administração Geral), Directorate General of Food and Veterinary (DGAV - Direção Geral de Alimentação e Veterinária), Portuguese Environment Agency (APA - Agência Portuguesa do Ambiente), among others.

Portugal		
2010	Decree-Law 86/2010	inspection of professionally approved pesticide application equipment
2013	Law 26/2013	sustainable use of pesticides
2013 and 2018	National Action Plan	National Action Plan for the sustainable use of pesticides
2015	Law 145/2015	placing of pesticides on the market
2017	Decree-Law 35/2017	distribution, sale and application of pesticides for professional use

Source: Author table.

ACKNOWLEDGMENTS

The author wish to thank the Calouste Gulbenkian Foundation that sponsored this work on the context of the LEAP - Policy Development Initiative, a training program for better public policy the development implemented under the Gulbenkian Sustainability Program, contributing to improve the capacity of various professionals to inform public policy related to this theme, and to enable a wider discussion on evidence-informed policymaking in Portugal.

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