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Food systems in depressed and contested agro-territories: Participatory Rural Appraisal in Odemira, Portugal

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Farming regions in Europe, particularly in the South, are increasingly feeling the effects of climate change due to factors such as drought, extreme weather events, and desertification, with severe consequences for food security and food sovereignty. Additionally, decades of rural mismanagement have left countless of these farming territories severely depressed as well as at the mercy of competition for their natural resources. This paper presents and discusses the results of a Participatory Rural Appraisal conducted in the region of Odemira, Southwest Portugal. Rooted in the frameworks of agroecology and food democracy, this mixed methodology aims to support people in multiply stressed agro-territories to diagnose the state of their food systems and agroecosystems from a democratic and ecological point of view and engage local actors in imagining fairer and healthier food futures for their regions. Local food actors were invited to identify and qualify the main problems in the region's food systems, complemented by an agroecological assessment of farm production systems. The results of the study confirm the status of Odemira as a depressed and contested agro-territory, whose social, economic, and ecological vulnerability is being compounded by the clash between the model of traditional smallholder farming and that of large-scale intensive agriculture. The study also shows the potential of sustainable farming practices as well as collaboration between the different food actors to support an agroecological transition in the region. However, to jointly realise food democracy and food system sustainability, the tensions resulting from the current political support for hyper-industrialisation and the lack of democratic, institutional, and legal mechanisms available to local actors will need to be addressed head-on.

KEYWORDS

food democracy, food sovereignty, food system, sustainability, sustainable transition, agroecology, Participatory Rural Appraisal

1. Introduction

Climate change is considered one of the biggest challenges worldwide, and the reshaping of the world's climatic patterns has already resulted in changing ecological systems. Recent trends indicate that global greenhouse gas emissions have tripled compared to pre-industrial levels, reaching over 1,900 parts per billion (Tollefson, 2022). In the last several decades, climate change has affected the environment and ecosystems in many ways: from increasing temperatures, decreasing water availability and food security levels worldwide to expanding land desertification.

To mitigate the effects of climate change and to maintain the world's temperature under 1.5 degrees to 2 degrees Celsius, compared to pre-industrial levels, as stipulated by the Paris Agreement, the European Union (EU) is set on making Europe the first climate-neutral continent by 2050 within the framework of the "European Green Deal" (European Commission, 2019). When assessing the chief mitigation and adaptation responses, the EU is particularly keen on reforming farming practices to achieve "fair, healthy, and environmentally-friendly" food systems (European Commission, 2019). The "Farm to Fork" and "Biodiversity" strategies (European Commision, 2020a,b), alongside the Sustainable Development Goals (SDGs), namely SDG 2—which aims to end hunger and all forms of malnutrition by 2030 (United Nations, 2015)—are deemed pivotal to the European sustainability pact. In this sense, the EU recognises that food systems are as much a major contributor to climate change, water stress, and pollution, not to mention their impact on human, animal, and ecosystem health, as they have the potential to reverse these fundamental problems.

The EU's sustainability goal is to repair food systems to deliver environmental, health, social, and economic benefits while eliminating injustices such as small-scale producers' low income and limited access to markets. In the above-mentioned European strategies, there is a clear push to drastically reduce pesticide and synthetic fertiliser use (up to 50% by 2030), decarbonise the food chain, and increase the area of organic farming and the availability of organic seeds. In this manner, the EU is trying to broaden its mitigation and adaptation options from a focus on flood protection, urban planning, and water management (Aguiar et al., 2018) to a new, more comprehensive, resilient, and sustainable approach: one that places food systems and their actors at the centre of a green, just, and inclusive transition (European Commission, 2019, p. 12).

Unfortunately, these key objectives have not been given clear targets. EU member states are systematically failing to invest in mitigating environmental degradation by intensive agricultural practices, e.g., large-scale monocultures of cash crops (BirdLife Europe and the European Environmental Bureau, 2022a,b). Instead, money continues to go to destructive forms of farming while vital environmental schemes are severely underfunded. Under the pretext of Russia's war on Ukraine, measures to ensure sustainability are further relaxed. Currently, the EU is not even remotely on track to deliver any of the targets and objectives set in the Green Deal (BirdLife Europe and the European Environmental Bureau, 2022a,b).

Besides climate change, ecosystems are being confronted with other tough challenges. Depressed farming regions, i.e., socio-economically disadvantaged, often more remote and interior rural territories, have suffered decades of rural mismanagement and political abandonment. A study from the Food and Agriculture Organisation (FAO) assessed that the world's most disadvantaged people work in agriculture or are themselves farmers, pastoral or fisher peoples (FAO, 2017). Due to these chronic and structural disadvantages, rural populations are systematically exposed to social, economic, and environmental risks, placing them in situations of vulnerability with little or no resilience to withstand the effects of climate change and other socioeconomic shocks (International Labour Office, 2017; Gondwe, 2019). Hence, it is expected that Europe's more economically disadvantaged countries, particularly those in the South, will disproportionately suffer the effects of drought, desertification, forest fires, loss of biodiversity, or decreasing agricultural productivity (Behrens et al., 2010, p. 15). In this regard, rural populations face many obstacles in realising opportunities to improve their livelihood due to geographical isolation and underdeveloped infrastructures such as transportation and weak institutions. Ultimately, to overcome these burdens, many abandon their farmland (Li and Li, 2017).

Furthermore, years of unsustainable and unchecked monoculture farming practices are creating a perfect storm for Europe's food systems (Wezel et al., 2018). Regions already in a situation of socio-economic and ecological vulnerability are also more prone to conflicts over natural resources, mainly ecosystem services derived from agroecosystems and minerals (Henle et al., 2008). This complex susceptibility has prompted us to call these multiply stressed regions "depressed and contested territories": areas that not only suffer from pervasive socio-economic and ecological distress but are also currently the object of competing developmental and market models. With an ageing and generally impoverished population that often lacks access to even the most basic social institutions, rural regions become contested territories regarding land management strategies, e.g., the needs and priorities of the diverse producer and worker typologies (Woods and McDonagh, 2011).

This clash of realities can be said to have at its core power asymmetries created by a hyper-industrialised and concentrated monoculture agriculture that generates pressure on the other actors in the region, such as small-scale producers, young people, and migrant workers who, forgotten by the State, have little or no say in what happens in their territory. For instance, traditional and peasant farmers—i.e., farmers who use labour-intensive practices, traditional knowledge and tools, and rely

more heavily on on-farm resources—are increasingly struggling due to a lack of financial and technical support and diminished access to land, markets, and knowledge (Guarín et al., 2020). Their small-scale operations are gradually disappearing, with some of the land lying abandoned, other parts snatched up by a new breed of large, often foreign corporations that are responding to opportunities in the global food markets for the production and sale of export cash crops—such as berries, avocados, almonds, tomatoes, olive oil, soybeans, corn, or palm oil. History shows us that agricultural trade has a colonialist legacy since it encourages the development of agricultural products in rural, more peripheral areas for a dominating class that benefits most from this power relationship (Gonzalez, 2004, p. 433). In many countries, large foreign companies pursue the expansion of monocultures at the expense of communities' livelihood, health, and food security. Several studies show how smallholders are affected worldwide ecologically as well as democratically by large-scale agricultural investments (e.g., Guereña and Burgos, 2014). The rise of large-scale intensive agricultural practices currently witnessed in the EU is already driving environmental challenges as well as socio-economic problems and democratic deficits: from land grabbing—the buying up or renting of large swathes of farmland at bargain prices by foreign investors—to human rights violations by the export-led agri-food business. For example, Gadea et al. (2016) demonstrate how large-scale agricultural companies in the Spanish region of Murcia have relied on migrant workers since the early 1970s to satisfy foreign market demand. Other studies reveal the power asymmetries, exploitation, and social pressure created by large-scale agriculture, as evidenced by the plight of Sub-Saharan migrants in the tomato-picking industry on the outskirts of Foggia, Italy (Melossi, 2021) or the challenges encountered by migrants and refugees when arriving in rural Greece (Papadopoulos and Fratsea, 2021).

The present work focuses on rural Portugal, specifically the municipality of Odemira, which is considered one of several multiply stressed agro-territories (i.e., agriculture-based territories) in the Alentejo farm region. These rural areas have a long tradition of periods of intensive farming practices and a chronically deficient distribution of wealth (Cutileiro, 1977; Évora, 2022). During the nineteenth and early twentieth centuries, until the agrarian reforms, these regions were characterised by a small number of large landowners who governed most of the land, forcing peasants to resort to hard labour to survive (Évora, 2022). Compared to other Mediterranean countries, international migration arrived later in Portugal (Fonseca, 2008). Nonetheless, the patterns are the same as in other Mediterranean countries (Pereira et al., 2021). Since the 1980s, Odemira has witnessed the settling of intensive farm enterprises within the perimeter of a natural reserve—the Parque Natural do Sudoeste Alentejano e Costa Vicentina (Bastos et al., 2012). This results in a more competitive environment for natural and institutional resources, while the effects of climate change are generating a gradual but rapid loss of natural resources (Município de Odemira, 2016; Pereira, 2019; Évora, 2022). Examples of the concentration of power and wealth in our area of research can be found in the work of authors such as Évora (2022), who assesses the social consequences of the rise of the berry industry, or Almeida (2020, p. 8), who indicates that in the wider Alentejo region, six foreign companies now own more than 65% of the olive plantations.

Considering not only the climate, water, and socio-economic stressors in this particular agro-territory but also the existence of competition for natural resources between farming models and the systematic disempowerment of traditional and peasant farmers, this paper investigates the Odemira region using the lenses of agroecology and food democracy. These theoretical, practical, and collective-action frameworks are uniquely suited to address both unsustainability and injustice in food systems. Agroecology is "an integrated approach that simultaneously applies ecological and social concepts and principles to the design and management of food and agricultural systems" (FAO, 2018, p. 1). While its origins can be found in the disciplines of ecology and agronomy, the field has been reshaped with the introduction of socioeconomic and cultural factors, including traditional peasant knowledge (Hernández and Ramos, 1977), as well as through its simultaneous politicisation (see for example Gliessman, 1978; Altieri, 1989). Today it is as much a science, prioritising holistic and participatory approaches, as a set of practices, building on local farmers' knowledge and priorities to promote the sustainable and viable use of local renewable resources, and a social movement, defending smallholder peasant and family farmers and their communities and local food systems.

Food democracy, on the other hand, has also evolved from a narrower needs-fulfilment perspective, for example, the "right to adequate food" as proposed by the United Nations Committee on Economic, Social and Cultural Rights (1999) and other rights-based food system approaches such as proposed by Anderson (2008), as well as early reflections by Lang (1998). The latter popularised the concept as "access to a decent, affordable, health-enhancing diet, grown in conditions in which [people] can have confidence" (1998, p. 18). Lang (2007, p. 12) later acknowledged that the idea of food rights bothered him: "Food rights can be abstract and lost. Food democracy has to be fought for and built into food culture." Proponents of food democracy have not just moved from a focus on control over food to control over the food system but have integrated the latter's sustainable transformation into the conceptual framework (Magdoff et al., 2000; Hassanein, 2003; López Cifuentes and Gugerell, 2021). The concept of food democracy, in parallel to that of agroecology, currently distinctly embraces a critical, politicised view of the global industrial food system, seeking ways to heal its ecological, social, economic, ethical, and cultural challenges through the involvement of all those affected.

Peasant movements and civil movements from the Global South, where agroecology has its roots, have favoured the closely related concept of food sovereignty, which claims peoples' rights to "healthy and culturally appropriate food produced through ecologically sound and sustainable methods, and their right to define their food and agriculture systems" (International Forum for Agroecology, 2015). Championed by the international peasant movement La Via Campesina (La Via Campesina, 2018), it stresses the producer's perspective, particularly that of small-scale, traditional, peasant, and family farmers (Renting et al., 2012, p. 293). Food sovereignty embraces both food democracy and agroecology to empower communities, citizens, and producers and facilitate the joint sustainable and democratic transformation of food systems.

The theoretical framework for this study is thus focused on realising the right of every person to nourishing, healthy, and responsibly produced food, as well as on underlining the pivotal role that small-scale, traditional, family, landless, and peasant farmers have in terms of ensuring both food justice and local sustainability.

Smallholder traditional and peasant producers generally inherited complex farming systems based on resource-conserving culturally adapted farming practices that integrate, most of the time, soil, water, plant, and animal management at a landscape scale (see e.g., Altieri, 2004; Mijatović et al., 2013; Altieri and Nicholls, 2020). In these traditional farming systems, knowledge, techniques, principles, long-term perspectives, and observations are based on local specifications. They are developed and used to enhance biodiversity, synergy creation, self- and community reliance, and environmental preservation. These producers can be characterised as dependent on and attached to the land. Even though the primary goal of this type of production is to provide subsistence for the household or community (Mijatović et al., 2013), this is often complemented by selling produce. Globally, most farmers fall into these categories, making up a third of the world population (see FAO, 2012; Lowder et al., 2016). However, they control a minority of the farmland and a fraction of the resources (financial, in the form of subsidies or credit, as well as natural) that go to resource-intensive, industrialised producers. For example, 85% of farms in the world are small (under 2 hectares) but control only 12% of agricultural land worldwide (Lowder et al., 2016), while about 8 out of 10 working poor live in rural areas (International Labour Office, 2012). Even though studies show small farms can be more productive than industrialised farms by a factor of between 2 and 10 (Rosset, 2000; FAO, 2014), there has been systematic underinvestment in smallholder farming. This paradigm can also be observed in Odemira, where the vast majority of the local producers are smallholder or small-scale farmers practising traditional, peasant, and/or family agriculture (PORDATA, 2022).

This study of the agro-territory of Odemira was guided by the objective of collaboratively characterising the current state of its agri-food sector, identifying the central tensions and convergences between the different agrarian models and the natural and social limits imposed by the resources, agroecosystems, and the socio-economic and socio-ecological conditions. The primary starting point for the research was the recognition of diverse local producers' perspectives, especially those with a history of being more marginalised. The research was designed based on the Participatory Rural Appraisal approach (PRA), with roots in agroecosystem analysis and systems and ecological thinking (Chambers, 1994, p. 954), to assess the sustainability as well as the level of democracy of Odemira's food and farming systems.

With the involvement of a diversity of actors from the region's food and farming systems, using a methodology combining documentary and participatory diagnostic tools, and triangulating the data obtained, this study aimed to answer the following research questions:

- What are the key challenges that can be identified for the Odemira agro-territory?
- What ecological and democratic tensions and convergences can be observed in the food system?
- What are the main contributing factors to the agro-territory's key stressors as perceived by its principal local actors?

This paper is structured as follows: the present section provides the backdrop and justification for our research, Section 2 presents the methodology, and Section 3 the results, which are then discussed in Section 4. Finally, some concluding remarks and suggestions for ways forward are offered in Section 5.

2. Methodology

The study's key objectives were to comprehensively assess, within the framework of agroecology and food democracy, the key challenges, tensions, and convergences that can be identified in the agro-territory of Odemira, as well as reveal the underlying contributing factors. To manifest our commitment to collective, action-focused reflection processes and the empowerment of the regions' community actors, the research design was constructed according to the principles of the Participatory Rural Appraisal approach (PRA). The latter is "an approach and methods for learning about rural life and conditions from, with and by rural people" (Chambers, 1994, p. 953). It offers a toolkit of methods to collect and process data on-site, involving the people whose community, territory, or livelihoods are being appraised. It is particularly appropriate for communities suffering multiple stressors because it is more responsive to their plight and perceptions, and more capable of eliciting reflexive data and uncovering the key factors that fuel the region's problems.

PRA has roots in agroecosystem analysis, anthropology, farming system research—which has revealed the capability of farmers as analysts of their systems—and finally, PRA's non-participatory antecedent, the Rapid Rural Appraisal (RRA) (Chambers, 1994, p. 954). In contrast to RRA, which seeks to incorporate local people's knowledge in the inquiry, PRA's essential resource is the analytical capabilities of local people (Chambers, 1994, p. 958). Chambers points out that rather than extracting information solely for planning processes beyond the community's needs, followed by offering advice, PRA can be characterised by the experiential training and collaborative learning that it can offer, as well as the empowerment of local people to take local action.

For the present analysis, this research took to heart Verdejo (2006, p. 6, our translation) motto, "to support community self-determination through participation and, thus, foster sustainable development". The actors identified during the first research phase (see Section 2.1) were contacted and informed of our intentions in order to involve them as much as possible in the research design process, thus ensuring the inclusion of essential information for the baseline analysis and allowing them to comment on the research objectives and methods and offer suggestions. Throughout all the phases of the research, these local actors were kept abreast of developments and ultimately invited to participate in the collective appraisal of Odemira as an agro-territory.

The research design triangulates three sources of data:

1. Baseline analysis of the agro-territory based on documentary research, including establishing a list of main actors in food and farming in the region;
2. Agroecological sustainability assessments at 16 farms drawn from four typologies;
3. Collective analysis and reflection with local actors to test and complete the baseline analysis as well as identify and analyse the key ecological and democratic challenges and tensions in the agro-territory.

In the following subsections, each of the methods used in the study is presented.

2.1. Baseline analysis

The documentary research aimed at collecting and considering the maximum possible amount of publicly available data and establishing a baseline against which the participatory data could be assessed. It included official statistics and data for social, economic, environmental, institutional, geographical, and political indicators, including information on Odemira's key geomorphological and climate characteristics, details about its population, a description of its economy, and facts on available infrastructure and connection to markets. Finally, we surveyed all national and international legislation and conventions that impact the agro-territory and catalogued the leading institutional, civil society, and food system actors. These actors were drawn from 13 typologies, informed by the authors' previous actor-based research (Uij and Bálint, 2020; Horstink et al., 2021). The final list of actor typologies for the PRA is presented in Table 1. A total of 87 actors were identified from the documentary research, complemented with a snowball approach by contacting known actors and asking for referrals.

TABLE 1 List of actor typologies for the PRA.

Typology number	Type of key actor
1	Producers
1.1	Conventional/industrial producers
1.2	Organic producers
1.3	Traditional producers
1.4	Agroecogical or Proto-agroecological producers
2	Other key actors
2.1	Associations or NGOs
2.2	Cooperatives
2.3	Collectives or networks
2.4	Local, regional, or national government
2.5	Public sector institutes
2.6	Academia
2.7	Schools/educators/trainers
2.8	Agri-food companies
2.9	Other actors

2.2. Agroecological sustainability assessments

For the agro-territory of Odemira, 32 producers were identified through the process described above, of which 16 were chosen across the four typologies for producers presented in Table 1 (conventional, organic, traditional, and agroecological). Six additional criteria determined which producers were contacted: location (coastal vs. interior regions), the destination of production (local sale, national sale, export, self-consumption, and mixed), type of production system, legal status, the size of the farm, and gender. Due to the lack of certified organic producers in the area, the typologies of organic and agroecological producers were combined into a proto-agroecological typology.

The producers' systems and practices assessments were conducted on-site using a closed-ended questionnaire, which covered 36 indices of agroecological sustainability. This was

complemented by a walk around the farm to observe the agricultural practices. Assessments typically lasted an hour to an hour and a half, and at the end, the scores on the different criteria were shared with the farmer to benefit their awareness of their activities.

The questionnaire used forms part of the Tool for Agroecology Performance Evaluation (TAPE), collaboratively designed by 70 organisations across the globe active in agroecology under the coordination of FAO. The motivation for its development stemmed from the opportunity presented by the science and practices of agroecology to create more sustainable, resilient and fair farming and food systems. TAPE builds on frameworks for sustainability evaluation that already exist to be as relevant and applicable as possible to different scales, regions, countries, and continents. Another requirement was that it should be simple in use, minimising data collection but allowing extendibility.

The tool's main objective is:

> [...] to produce consolidated evidence on the extent and intensity of the use of agroecological practices and the performance of agroecological systems across five dimensions of sustainability: (i) environment, (ii) social and cultural, (iii) economic, (iv) health and nutrition, and (v) governance.
>
> (Mottet et al., 2020, p. 2)

TAPE measures 10 criteria for sustainable transition, modelled on the 10 elements of agroecology defined by FAO (2018): Diversity, Synergies, Efficiency, Recycling, Resilience, Culture and Food tradition, Co-creation and Sharing of Knowledge, Human and social values, Circular and Solidarity Economy, and Responsible Governance. Each criterion is assessed using three or four semi-quantitative indices presented as descriptive scales, which can be scored ranging from 0 to 4 (Mottet et al., 2020, p. 7). For example, the criterion of efficiency is measured by the following indices: (i) use of external inputs; (ii) management of soil fertility; (iii) management of pests and diseases; (iv) productivity and household needs. The scores on each of these indices are summed and transformed into a percentage (i.e., a respective score on the four Efficiency indices of 2, 3, 4, and 2 would result in an overall Efficiency score of 68.75%). Scores of up to 39% are considered low (below 20% very low), between 40 and 60% indicate a farm in transition, whereas scores of 60% or more show well-performing farms in terms of agroecological sustainability (with scores over 80% indicating outstanding performances). The percentage scores on the 10 criteria are averaged to provide an overall agroecological transition/sustainability score for each farm, called CAET: characterisation of agroecological transition. Full details on the tool, as well as the questionnaire, can be found in FAO (2019) and Mottet et al. (2020).

The 16 farms were evaluated based on their performance on the 10 criteria and 36 indices from the TAPE tool. Each farm's single and average score on the 10 criteria was projected as an individual outcome, and the scores of all farms on each of the 36 indices that make up the 10 criteria were projected as collective results.

2.3. Collective analysis and reflection

Out of the 87 food system actors contacted in the study, 20 were selected for a workshop based on their technical, cultural, and historical knowledge, as well as their connection to the agro-territory and willingness/reachability to participate. All participants were contacted *via* email and telephone and represented individual producers, cooperatives, associations/NGOs active in the local food systems, development NGOs, local researchers, local politicians, and social movements. The workshop was conceived to collectively analyse the main characteristics, key challenges, and critical problems of Odemira as an agro-territory. To achieve this goal, the following techniques from the PRA toolkit were used:

- Collective agrarian memory exercise;
- Community mapping, evaluating the economic, social, cultural, and institutional resources of Odemira;
- SWOT (strengths, weaknesses, opportunities, and threats) analysis of Odemira's food and farming system(s);
- Problem identification and prioritisation regarding Odemira's food system(s);
- Problem tree exercise—analysing causes and consequences of critical problems;
- Free flow reflection exercise in the final plenary.

The workshop was complemented by four short semi-structured interviews with additional important local actors, using the same questions as in the workshop. The interviewees were: local government (two), NGOs (one) and development NGOs (one).

3. Results

3.1. Baseline analysis of the Odemira agro-territory

The municipality of Odemira (see Figure 1) is located in the south of Portugal. It is part of the district of Beja and a sub-region of Alentejo's coastal area. With a territorial extension of 1,720.6 km^2 and a 55 km coastline, Odemira is Portugal's largest county. It shares territory with the ecological reserve Parque Natural do Sudoeste Alentejano e Costa Vicentina and

FIGURE 1
Map of Odemira. Source: Município de Odemira (2016).

the Natura 2000 network. In terms of topography, Odemira's landscape varies from a plateau topography on the coast to hills, or small mountain chains, in the inland region, where streams interconnect to flow into the rivers Mira and Sado and, ultimately, the sea. Between the plateau and the hill region there is a transition zone where the main villages of the municipality are concentrated.

Odemira's climate is temperate Mediterranean with dry and mild summers. Due to its proximity to the sea, average annual temperatures are mild, between +14°C and +18°C (Bastos et al., 2012). However, they can oscillate between −4°C in January and +40°C in July (Município de Odemira, 2016, p. 13). The average precipitation is between 600 and 800 mm, occurring mainly between October and May, while during May to September, little or no rainfall is observed, with only the occasional fog (Município de Odemira, 2016, p. 13).

Odemira is expected to be particularly vulnerable to climate change, with a decrease in precipitation and an increase in average temperatures (Município de Odemira, 2016, p. 31). Major climatic events and associated vulnerabilities that have been already identified are (i) high temperatures/heat waves (which, due to monoculture farming patterns, cause a significant risk of wildfires), (ii) drought (causing biodiversity loss and damage to endemic flora), (iii) storms/tornados (causing an interruption or reduction of water supply and/or reduction of its quality) and, finally, (iv) excessive precipitation/ floods (causing coastal erosion) (Município de Odemira, 2016, p. 40). Climate change is expected to place the territory at risk for serious social, economic, and environmental problems, such as deteriorating living conditions, major ecosystem fragility, and damage to economic activities (Município de Odemira, 2016, p. 40).

The territory's ecological vulnerability is very high, considering that this is one of few European areas where wild coastal stretches and endemic habitats undamaged by human action can be observed (Ferreira, 2010). The region presents unique ecological characteristics, among them a remarkable endemic floristic heritage (Canha, 2010, p. 52) and extraordinary fauna such as the Boga-portuguesa (Chondrostoma lusitonicum), the otter (*Lutra lutra*), the striated terrapin (*Emys orbiculoris*) and several species of bats (Canha, 2010, p. 52–53). The region also offers unique habitats (including temporary freshwater ponds), which provide vital ecological functions for the local fauna and flora, e.g., for the white storks and other endemic species nesting on the sea cliffs of the coastal strip.

The town of Odemira, as the county seat, takes on a particular centrality in the territory: this is where the primary public and commercial services, light industry, and business parks are located (Palhinhas, 2019). The most remote interior part of the municipality can be characterised by forestry, cork extraction, and extensive livestock pastures (Palhinhas, 2019).

As in most interior and rural areas in Portugal, Odemira has a small and ageing population: over 27% of people are 65 years or older, and <10% are under 15 (PORDATA, 2022). Displaying a population density of 25.6 hab/km² in 1960, Odemira's population subsequently fell by 40% between 1960 and 1991

because of the rural exodus (Município de Odemira, 2020). By 2019, population density had been reduced to 14.3 hab/km². Nevertheless, Odemira is the only municipality in the Alentejo region that has recently increased its resident population: from 26,066 people in 2011 to 29,576 in 2021, a growth of 13.5% (INE, 2021), including a significant number of seasonal migrant workers. Immigrants now represent 39% of the total population (Oliveira, 2021). The first wave of migrants arriving in Odemira consisted principally of Northern European citizens who sought to improve their quality of life after retirement, as well as citizens from Portuguese-speaking African countries who migrated to Portugal for access to better education (Município de Odemira, 2020). However, the most significant increase in population density can be associated with the needs of agribusinesses linked to the expansion of intensive agriculture (Moreno et al., 2016). Agricultural, largely seasonal workers were initially from Eastern Europe and Brazil (Moreno et al., 2016). However, from 2014 onwards, Asian migrants became the primary hired labour (Moreno et al., 2016; Município de Odemira, 2020).

In 2020, out of the 15 largest employers of the municipality, eight were related to agriculture and forestry (Gabinete de Estratégia e Estudos do Ministério da Economia e do Mar, 2019, p. 6). Moreover, while exportations of goods for Odemira in 2021 were valued at over 220 million euros (INE, 2022), agriculture stands out. The 22 largest companies of the municipality that are represented by the association for Horticulturists, Fruit growers and Floriculturists—AHSA—had revenues of over 200 million euros (AHSA, 2022). Together, these corporations employ 3,500 people, operate on over 2,000 hectares, and export about 80% of their produce to European countries (AHSA, 2022).

The average size of farms in Odemira is 48 ha (data from 2019), higher than the country's average of 14.6 ha, with almost 80% of farms holding ∼20% of farmland or 15,342 ha, while slightly over 20% of farms (363) control 80% of the land (PORDATA, 2022). Statistics also indicate that over 60% of farms operate on <20 ha. Most farmers (87%) are single producers, with only 213 operating as a company. Odemira being traditionally an area of extensive cattle-raising, it is common for producers to rent land for grazing (30% of farmland is rented). Finally, the area dedicated to intensive horti-, floriculture, and fruit growing is rapidly increasing and now covers close to 3,000 ha (INE, 2019).

The Mira irrigation system supplies the water needed for these agricultural holdings. The Alentejo is the region with the largest irrigated area (38% of the total area) and the one that registered the most significant expansion—a 54% increase compared to 2009 (INE, 2019, p. 8).

Odemira's biodiversity and natural ecosystems are under serious threat from the expansion of agriculture and tourism, according to an analysis of the effects of these sectors (Canha, 2010). Although Odemira has seen periods of intensive farming over the centuries, including several wheat campaigns and the advent of the Green Revolution, the scale at which industrialised farming is now expanding in the area is unprecedented. As Canha (2010, p. 105) warns, in just 11 years more than 40% of the temporary ponds in Odemira have been destroyed due to drainage or excavations. Additionally, the National Institute for Nature Conservation and Biodiversity (ICNB, 2009) demonstrated that the recent agricultural intensification is causing water pollution and depletion due to intensive irrigation and the use of high quantities of synthetic fertilisers and phytosanitary products. This affects biodiversity and local habitats protected by law due to their integration into legal frameworks such as the Natura 2000 Network (ICNB, 2009, p. 12). However, without serious environmental studies or environmental assessments conducted by the municipality, quantitatively assessing the cumulative environmental impact on ecosystems and resources has been very challenging. The media has been the primary source of warnings about the negative externalities of the agro-industry for the past few years (e.g., Público, 2019; RTP, 2021; TVI, 2021). These range from water shortages, mainly in the form of water rationing but also by cutting off access to water for some small-scale farmers, to plastic pollution derived from the "plastification" of the landscape with the expansion of greenhouses for cash crops. The general public is becoming increasingly outraged, and in 2020 a public petition with 6,000 signatures was delivered to Parliament criticising regional and national governments for not only consistently failing to address serious issues and violations recorded in official reports but also for allowing the area of plastic greenhouses to triple while ignoring essential infrastructures, such as hospitals, playgrounds, and schools.

Besides the documented impact on the environment and the contribution to the drastic depletion of resources, intensive agriculture in the area has aggravated structural socio-economic vulnerabilities such as labour instability in the form of insecure temporary and seasonal labour contracts (Município de Odemira, 2020). Additionally, the agro-industrial development has generated downward pressure on wages (Gabinete de Estratégia e Estudos do Ministério da Economia e do Mar, 2019, p. 10). It has unveiled a lack of respect for and protection of human rights, creating the perfect environment for exploitative practices involving economic migrants, e.g., labour contracts that are not translated or working hours that are poorly accounted for (Município de Odemira, 2020). The rapid increase in migrant agricultural workers has, additionally, caused upward pressure on rents and downward pressure on the availability of living and commercial spaces. This complex situation of vulnerability, alongside the depletion of local fauna and flora due to rural mismanagement and climate change, created a territory that can be characterised as "depressed and contested", suffering from structural ecological and socio-economic challenges as well as democratic deficits and blatant injustices.

3.2. Agroecological assessment of local farms in Odemira

Table 2 provides a detailed description of the 16 assessed farms based on nine indicators: typology, region, gender, productive system, crop types, workers (including family), farm size including land distribution, production destination, and legal status. Table 3 shows the farms' agroecological transition/sustainability scores using the TAPE assessment tool. First, the sample will be described according to the indicators, and then the overall sustainability scores are discussed. As will become clear, the indicators that best distinguished respondents and impacted their scores on the TAPE questionnaire were location, production system, the size and land distribution of the farm, and legal status.

Typology-wise, the majority of farmers were traditional (9), followed by proto-agroecological farmers (5) and finally, conventional/industrial farmers (2). This indicator differentiated most strongly between farms and is therefore discussed in detail when the overall sustainability scores of the farms are presented.

Most farmers interviewed were located in the interior region (8), followed by the transitional region (5) and finally, the coastal region (3). Farm location tended to significantly influence the different dimensions of sustainability of the farms for the following reasons:

1. **The coastal area** represents a hotspot for multinational and local companies that produce mainly for export due to good farming conditions (e.g., easily workable soils with abundant water and suitable climatic conditions without frost during the winter).
2. **The intermediary/transition zone** is a stretch of land in the municipality, oriented South-North, which divides the interior from the littoral and is mainly characterised by important villages in terms of population and services. This transition zone has no access to centralised irrigation or major markets but having the largest population share, it offers an opportunity for direct sale to small-scale producers.
3. **The interior zone** is situated east of the intermediary area and is the most desertified in terms of population, soil, and climate. Even though the largest water reservoir is located nearby, the centralised irrigation system extends only to some portions of this area. The area is dominated by traditional farmers and characterised by an ageing population, with very little or no access to infrastructure to support the output of products.

The gender spread mainly favoured male producers (as expected in a region with many traditional farmers). Nevertheless, five of the sixteen holdings were either managed or co-managed by women, representing all the typologies.

Regarding the type of productive system and crops, a significant impact of the farms' production choices on their sustainability performances could be found. Most farmers either engaged in fruit and/or vegetable production systems, agro-pastoral and agro-silvo-pastoral systems, or both. Agroforestry and arable systems each had just one representative. However, 10 farmers possessed permanent pastures; therefore, even those specialising in the production of fruits and/or vegetables decided to incorporate animals into their operations, an important contribute to on-farm resources. Similarly, 14 farmers decided to grow fruit trees, which is frequently considered a crucial component of self-sufficiency, while providing cover for other plants. We found that, except for an agroforestry holding, a sizable industrial holding in the littoral, and a proto-agroecological farmer in the transitional zone, the land set aside by farmers for natural vegetation was frequently residual. The overall amount of natural vegetation was seven times smaller than the total amount for agricultural production and five times smaller than the total amount of permanent pastures. Likewise, even though most farmers had timber and non-timber trees on their lands, only five exploited timber trees, while four exploited non-timber trees, primarily cork oaks. This phenomenon occurs due to the common practice of renting land from large landowners without the legal authority to use the trees for commercial purposes.

The vast majority of the farms (14) hired between one and four workers, with only two employing 20 or more agricultural workers. Seven farms, all traditional or proto-agroecological, relied exclusively on family labour.

Concerning farm size, five farms operated on more than 100 hectares; six farms occupied between 30 and 100 hectares; two farms covered <5 ha, while the smallest three were just under one hectare. The farms with better overall sustainability scores were the smallest (below 1 ha) and intermediate-sized (between 20 and 100 ha). Notably, these included all the proto-agroecological farms. Additionally, those farms that reserved the most significant area for natural vegetation and/or practised very extensive farming were among the farms with the best overall sustainability scores.

The production destination we encountered was predominantly sale combined with self-consumption for all farms, although three farmers produced chiefly for subsistence purposes. The farms with a pastoral component, as well as the conventional farms, exported their goods and/or sold them at a national level. This is because the market for the dominant product in the area, cattle-raising, is controlled by a limited number of intermediaries who export live animals. This is different for traditional horticultural and fruit producers, who have less or no access to national markets, and tend to sell where

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TABLE 2 Description of assessed farms in the Odemira region.

Indicators	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
Typology	Proto-agroecological	Traditional	Traditional	Traditional	Traditional	Traditional	Proto-agroecological	Traditional
Gender of principal farmer/owner	M	M	M	M	M	M	M	F
Type of region	Transitional region	Interior region	Transitional region	Interior region	Interior region	Transitional region	Transitional region	Interior region
Productive system	Vegetable production	Agro-pastoral	Agro-silvo-pastoral	Agro-silvo-pastoral	Agro-pastoral	Agro-pastoral	Fruit production	Fruit and vegetable production
Crops and crop products (1 = yes; 0 = no)	1	1	1	1	1	1	0	1
Animals	1	1	1	1	1	1	0	1
Fruit trees	1	1	0	1	1	1	1	1
Timber trees	0	1	1	1	0	0	0	0
Non-timber products	0	0	0	1	0	0	1	0
People in the family (PF) excluding children	2	2	3	6	2	2	1	2
Total workers (including PF)	1	1	3	3	2	2	1	2
External workers last 12 months	No	No	No	Yes	No	No	Yes	Yes
Total area under agricultural production (ha)	0.2	50	80	200	30	34	1	0.2
Total area under permanent pasture (ha)	0.05	60	80	450	370	14	10	0.2
Total area under natural vegetation (ha)	0.1	2	0	0	10	0	60	0
Production destination	Mostly sale and a small part for self-consumption	Mostly sale and a small part for self-consumption	Mostly sale and a small part for self-consumption	Mostly sale and a small part for self-consumption	Mostly sale and a small part for self-consumption	Mostly sale and a small part for self-consumption	Mostly sale and a small part for self-consumption	Mostly sale and a small part for self-consumption
Legal status	Individual producer	Individual producer	Ltd company	Ltd company	Individual producer	Individual producer	Ltd company	Individual producer
Indicators	**Q9**	**Q10**	**Q11**	**Q12**	**Q13**	**Q14**	**Q15**	**Q16**
Typology	Proto-agroecological	Traditional	Proto-agroecological	Traditional	Proto-agroecological	Conventional	Traditional	Conventional
Type of region	Interior region	Interior region	Transitional region	Interior region	Interior region	Littoral region	Littoral region	Littoral region
Gender of principal farmer/owner	M+F	M	F	F	M	F	M	M
Productive system	Agroforestry	Fruit and vegetable production	Vegetable production	Agro-pastoral	Fruit and vegetable production	Fruit production	Vegetable production	Arable farming
Crops and crop products (1 = yes; 0 = no)	1	1	1	1	1	0	1	1

(Continued)

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TABLE 2 (Continued)

Indicators	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16
Animals	0	0	0	1	1	0	1	0
Fruit trees	1	1	1	1	1	1	1	0
Timber trees	1	0	1	0	0	0	0	0
Non-timber products	0	1	0	0	1	0	0	0
People in the family (PF) excluding children	8	1	2	2	0	0	1	4
Total workers (including PF)	4	1	1	2	2	650	1	25
External workers last 12 months	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Total area under agricultural production (ha)	0.05	5	0.16	15	0.8	80	1.5	60
Total area under permanent pasture (ha)	0	0	0	15	8.5	0	0	0
Total area under natural vegetation (ha)	33	1	0	0	60	25	0	2
Production destination	Mostly self-consumption and a small part for sale	Self-consumption	Mostly self-consumption and a small part for sale	Mostly sale and a small part for self-consumption	Mostly sale and a small part for self-consumption	Sale	Mostly sale and a small part for self-consumption	Mostly sale and a small part for self-consumption
Legal status	Association	Individual producer	Informal producer	Individual producer	Informal producer	Incorporated company	Individual producer	Ltd company

they can locally, which is often the women's responsibility in the case of the smallest farmers. Likewise, proto-agroecological farmers tend to concentrate on horticulture and depend on local markets to sell their produce. As a rule, all farmers, except for the corporation, strived to keep a part of their harvest for self-consumption.

Finally, regarding legal status, as is typical for the region and Portugal, most traditional farmers were individual producers. Proto-agroecological farmers operated in more unusual legal formats: two were unregistered, and one worked within an association.

Next, the results of the 16 farms on the score for the characterisation of agroecological transition (CAET), as shown in Table 3, are discussed.

While none of the farms received scores higher than 70% in this study, the farms designated as proto-agroecological received better marks, with the best of these farms obtaining a score of 68%. This is a compelling case for changing production methods to an agroecological or proto-agroecological approach since agroecological practices encourage interventions at all levels of the food and farming system. Additionally, two traditional farmers in the interior received extremely high marks, with 62% (Q8) and 69% (Q4), respectively. The latter is the highest-scoring farm (a father and son duo), operating in an agro-silvo-pastoral system that combines sizable regions for crop production with sizable areas for extensive pasturing. This combination favours healthier soils (fertilised by animals) which, in turn, increase productivity and quality of livelihood in the sense that, besides selling their produce, these farmers could achieve a very good diet by combining the fruits of their production with products bought with their revenue.

This study anticipated lower results from farmers in the interior region, given the more challenging social, economic, and environmental circumstances. However, Odemira county's interior was home to four of the top seven scorers. This demonstrates that sound agricultural practices, particularly the closing of production cycles, matter, independent of the farms' starting circumstances.

The lowest-scoring farmer (Q15 with 39%) was a struggling traditional farmer located in the littoral. This farmer had great difficulty anticipating demand and suffered from the competition of large agribusinesses in the area. The soil on his farm was severely degraded, and even though he was aware of good practices, this farmer had no possibility of implementing

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TABLE 3 Overall percentage results of the characterisation of agroecological transition (CAET) for the 16 farms.

Elements of agroecology	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Avr
Diversity	69	63	44	75	56	56	44	63	50	50	56	31	63	63	38	38	54
Synergies	56	63	81	63	50	44	69	44	56	50	38	38	63	38	31	25	50
Efficiency	50	50	44	75	50	63	75	94	88	69	75	63	75	50	50	31	63
Recycling	50	50	50	69	50	63	63	63	69	50	56	44	63	44	38	50	54
Resilience	55	41	55	56	52	52	55	41	63	44	39	33	66	72	34	66	51
Culture and food tradition	67	75	75	75	83	83	67	83	67	83	75	75	58	58	67	67	72
Co-creation and sharing of knowledge	67	25	25	67	42	50	67	33	75	25	67	50	67	67	17	58	50
Human and social values	88	50	75	69	56	56	75	63	92	58	75	63	81	67	38	83	68
Circular and solidarity economy	83	58	50	50	42	75	58	92	58	50	83	25	67	42	42	17	56
Responsible governance	75	33	58	92	50	33	67	42	67	67	58	42	75	92	33	67	59
CAET	66	51	56	69	53	57	64	62	68	55	62	46	68	59	39	50	

Colour code: 0–19% red (very low); 20–64% orange (low); 40–59% yellow (in transition); 60–79% light green (good); 80–100% dark green (very good).

them as he was working alone. He often applied industrial-style practices, further degrading his soil and increasing his water demand. Like another low scorer in the interior region (Q12 with 46%), this farmer's land lacked tree cover, natural vegetation, and the presence of timber or non-timber trees. Both farmers also practised poor crop rotation and failed to integrate animals in their crop production satisfactorily: neither feeding them from the farm nor sufficiently using their manure.

The remaining farms presented an intermediate score (between 50 and 59%). They were almost equally distributed between the coastal area, the intermediary zone, and the interior region. Two were large conventional farmers/ companies, while the remainder were traditional farmers. Even though the two conventional farmers failed to improve their sustainability on all dimensions beyond the satisfactory level, despite their capacity to do so, the traditional farmers maintained average scores despite their vulnerabilities and limitations. These findings highlight the significance of selecting sound, sustainable, and regenerative agricultural knowledge and practices independent of farming, financial, and infrastructure conditions.

Table 4 presents the cumulative score of all the assessed farms on the 36 TAPE indices. The maximum cumulative score that could be obtained on each index was 4 (highest score) * 16 (number of farms) or 64 points. Bearing this in mind, it is possible to observe several trends.

We find evidence of vulnerability for all assessed farms in several vital indices. Overall, farms demonstrated deficient integration of crops with livestock or aquaculture, which increased their dependence on external factors, mainly feed and fertilisers. Although most farms had animals, they usually had no more than one or two species and small numbers of animals, while animal welfare was not always guaranteed. The fact that farms were failing to diversify their activities, products, and services adequately denotes a tendency towards specialisation (rather than polyculture) and a general lack of knowledge or interest in complementary activities, such as crop transformation, agro-tourism, or on-farm course offerings. Investment in renewable energy was practically non-existent beyond using firewood for heating. Farmers' overall very low adhesion to producer organisations and associations was equally worrying. This is not necessarily by choice; several farmers indicated their desire to join an organisation but could not find any in their area. Similarly, very few producers had access to formal or informal platforms for the horizontal creation and transfer of knowledge and good practices. Finally, the lack of opportunities and decent work for young people in farming contributes to their abandoning the activity of their parents and grandparents, with subsequent abandonment of farmland and high levels of youth emigration.

The Odemira food systems revealed other vulnerabilities that can be considered on the low end of transition (i.e., closer to 40% of the maximum score than 60%). Key among

TABLE 4 Cumulative score of the 16 assessed farms on the 36 TAPE indices (max score = 64).

Attribute	Indicator	Sum
1. Diversity	Crops	52
	Animals	19
	Trees and other perennials	45
	Diversity of activities, products and services	21
2. Synergies	Crop-livestock-aquaculture integration	22
	Soil-plants system management	41
	Integration with trees	33
	Connectivity between elements of the agroecosystem and the landscape	33
3. Efficiency	Use of external inputs	31
	Management of soil fertility	41
	Management of pests and diseases	40
	Productivity and household's needs	48
4. Recycling	Recycling of biomass and nutrients	44
	Water saving	45
	Management of seeds and breeds	35
	Renewable energy use and production	15
5. Resilience	Stability of income/production and capacity to recover from perturbations	36
	Mechanisms to reduce vulnerability	33
	Environmental resilience and capacity to adapt to climate change	28
	Average score on the element of Diversity	34
6. Culture and food tradition	Appropriate diet and nutrition awareness	57
	Local or traditional identity and awareness	39
	Use of local varieties/breeds and traditional knowledge for food preparation	43
7. Co-creation and sharing of knowledge	Platforms for the horizontal creation and transfer of knowledge and good practices	23
	Access to agroecological knowledge and interest of producers in agroecology	35
	Participation of producers in networks and grassroot organisations	38
8. Human and social values	Women's empowerment	53
	Labour (conditions, etc.)	49
	Youth empowerment and emigration	25
	Animal welfare (if applicable)	29
9. Circular and solidarity economy	Products and services marketed locally	46
	Networks of producers, relationship with consumers and presence of intermediaries	30
	Local food system	31
10. Responsible governance	Producers' empowerment	45
	Producers' organisations and associations	15
	Participation of producers in governance of land and natural resources	54

these are the insufficient direct connection to consumers and significant dependence on intermediaries. At the same time, farmers and their families greatly depend on products sourced outside their communities. Related to these lacunae is the absence of mutual support between producers, partly caused by the region's isolation.

In terms of their resilience, farmers revealed a low capacity to adapt to climate and environmental change. All of them were affected to some extent by climate change, particularly the significant loss of water resources that occurred in the year this paper was written. Most traditional and proto-agroecological farmers do not have ready access to credit lines and insurance, which are essential mitigating factors for climate and economic stress. Traditional farmers were all found to be operating at the limit of their ability to sustain themselves economically and ecologically. Many of the farmers had seen their annual returns decrease despite maintaining their level of production due to the current economic climate, where input factors are becoming drastically more expensive. At the same time, this is not accompanied by higher prices for producers.

On the positive end of the scale, farmers showed several strengths as well as potential. As a rule, the people interviewed: reasonably integrated agricultural production with trees; self-produced a good part of the seeds they used and bought most of the animals locally; managed to market all or part of their products locally (in the case of traditional horticultural and fruit growing farmers); had reasonable access to or mastery of agroecological knowledge and were somewhat interested in agroecology; remained connected to their local communities, participating in local cultural events, and identified with traditional local culture; showed a good diversity of crops and trees and other perennials; and applied good practices such as mulching and crop rotations to preserve soils. In addition, most farmers had good knowledge of alternative practices to avoid the application of synthetic products. The majority recycled at least some of the biomass produced on their farm as well as other wastes. No hunger was observed among the people interviewed in the municipality of Odemira: all had access to diverse and nutritious food and were able to meet most of their food needs with their production. Farmers also sought out different ways of saving and conserving water. Moreover, although they generally considered that the work was hard, they were satisfied with their working conditions and felt entitled to make their own decisions. Significantly, women were involved in or shared decision-making in practically all production systems. Farmers were aware of their rights, although they did not necessarily consider that these were respected.

The TAPE evaluation results were plotted against the farms' descriptive attributes: typology, geographical location, gender, farming system, and legal status. Geographical location and typology showed a significant difference in scores between farmers and were thus further explored. Figure 2 plots the TAPE results on the 10 criteria according to geographical location. The farmers in the littoral zone showed a high degree of transition in only two sustainability categories—Responsible Governance and Resilience—which can be attributed to their larger size, sales- and export orientation, and their better integration in producers' organisations and associations. Hence, these producers are empowered and have control over their human, social, economic, and political rights due to their capacity and means to develop their livelihoods, improve their competencies, and request assistance to access markets or political institutions. Likewise, in terms of resilience, most of these producers have a stable income, stable production, and ready access to credit, thus, a greater capacity to recover after any disturbance. They also receive most of the national/European subsidies and tax benefits. Nevertheless, the littoral farms scored lower than those in the other regions in most categories: Synergies (lack of integration of animals and/or trees in their crop production), Circular and Solidarity Economy (no connection with consumers), Efficiency and Recycling (little or no interconnection between elements in the production system), and, albeit less significantly, Diversity (favouring monocultures), Human and Social Values (significant social and economic gap between landowners and agricultural workers, the former controlling the labour relationship and conditions), and Culture and Food Tradition (feel less connected to the community and local cultural and food traditions).

While Figure 2 shows that farmers in the interior and intermediary zones had scores that were close, intermediary zone farmers may have a modest advantage because they have better access to infrastructure and markets, as well as a more organised engagement with their communities.

Farmers in the interior—a region that is becoming more and more arid—typically have more ageing and isolation issues. However, isolation has been shown to encourage the production of farm inputs (such as natural fertilisers) and the choice of a wider variety of plants, trees, and crops. Additionally, these farms frequently employ more resource-saving practices. This once again demonstrates that sustainability is possible despite the challenging circumstances on some farms, even though socioeconomic and democratic mechanisms (e.g., inclusion) are required to combat marginalisation, isolation, and poverty.

Figure 3 displays the TAPE results by farm typology (traditional, proto-agroecological, and conventional). These results largely support the discussion regarding Figure 2: conventional export-oriented producers (located in the littoral) have the means and resources to mobilise networks, create partnerships, access knowledge and technology, and manage labour relations and conditions, while they can mitigate the effects of climate change with access to capital. Nonetheless, their weaker score overall can be related to their choice of intensive industrialised agriculture, which tends to rely on external, often synthetic, factors for their inputs, has low integration of animals and trees, and is focused on export.

It is also evident that traditional farmers in Odemira frequently have more unstable land ownership, suffer from worse working conditions than other typologies, are more isolated, on average older, and lack access to networks or platforms. Of all farmers in the region, these traditional

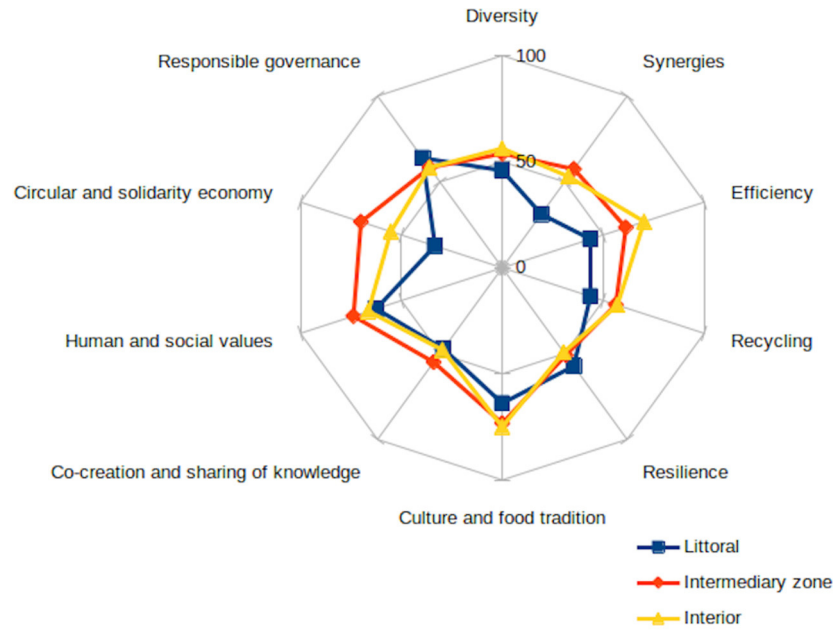

FIGURE 2
Results of TAPE—Step 1 according to geographical area.

farmers are politically the most marginalised and susceptible to precariousness with little capacity to improve their situation.

Figure 3 additionally confirms that the proto-agroecological farms dominate the ratings. They display the strongest sustainability score of all surveyed farms in seven out of 10 categories, namely Diversity, Synergies, Efficiency, Recycling, Co-creation and Sharing of Knowledge, Human and Social Values, and Circular and Solidarity Economy, despite being slightly less resilient and less in control of land and resource governance than conventional farmers. Although there is room for improvement, e.g., the better integration of animals in the production system and a better choice of crop diversity, this type of production is the most consistent and promising in achieving a successful transition towards sustainable ecological farm systems.

Finally, it is also apparent from Figure 3 that conventional/industrial farmers show the least consistency in their scores. While strong on Responsible Governance and Resilience, they are fragile on Synergies, Efficiency, and Circular and Solidarity Economy, with low scores as well on Diversity and Recycling.

The results of this evaluation were consistent with what Mottet et al. (2020, p. 7) predict: high scores across all 10 elements are necessary to achieve sustainability/agroecological transition in a specific system. On the whole, it is possible to postulate that Odemira's food systems show good potential for becoming agroecologically sustainable food systems, with proto-agroecological systems taking the lead. However, as will be deliberated in Section 4, a number of conditions and mechanisms need to be in place for these farms to thrive. The conditions refer mostly to the protection of and access to essential resources, such as water, and the putting in place of infrastructures to support the local food systems. The mechanisms needed are mostly democratic in nature: the organisation of producers in networks, cooperatives, and associations; the promotion of knowledge-sharing; the establishment of a closer connection between local producers and local consumers; and improvement of working opportunities and conditions in farming.

3.3. Collective analysis of the Odemira agro-territory

The collective appraisal exercise, conducted during a workshop, focused on the identification of (i) the agro-territory's strengths, weaknesses, opportunities and threats (SWOT analysis); (ii) the primary problems affecting Odemira's food and farming systems; (iii) the analysis of the root causes and effects of the top three problems.

The strengths put forward by participants and interviewees related primarily to the existence of a more traditional/organic type of production, a connectedness to the land, and the persistence of a traditional and peasant identity, of which traditional seed saving and participation in cultural events were good indicators. To this, participants

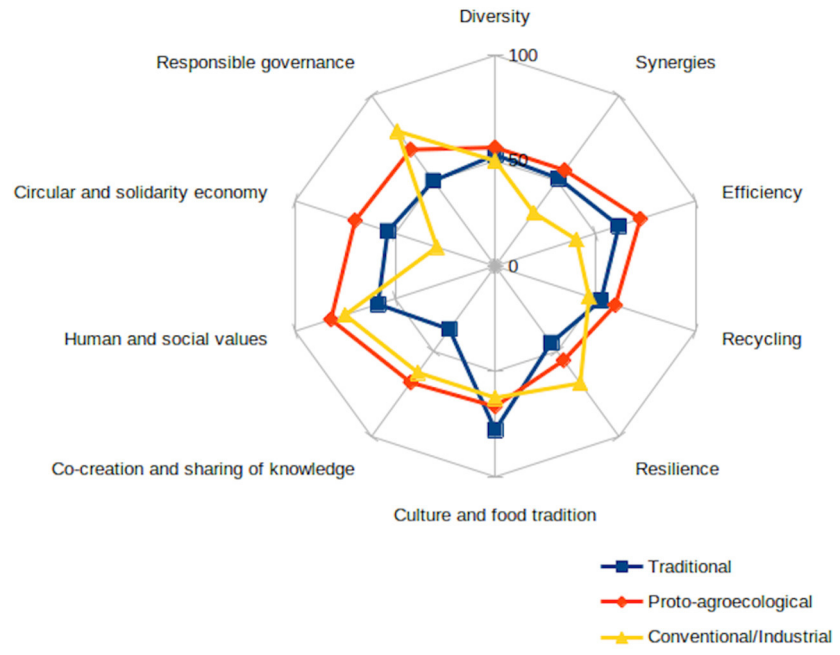

FIGURE 3
Results of TAPE—Step 1 according to farm typology.

added the advantages of a vast territory with favourable morphogenetic characteristics and the development of new diversity with the arrival of immigrants. The latter phenomenon acts as a cultural "melting pot" that is leading to new, more democratic organisational forms, including new cooperatives and different ways of engaging with diverse rural realities.

Turning to the agro-territory's weaknesses, participants and interviewees highlighted the effects of the recent rapid development of intensive industrial agriculture and tourism. This has come with many hidden costs, including reports of modern slavery, human trafficking, overcrowded housing, and generally poor working conditions for agricultural workers. Human trafficking and exploitation, according to several of the local actors who were interviewed, are "out of control" since the county is not socially or institutionally equipped to handle the current level of incoming demands. Examples of the county's lack of readiness include the national government's dearth of assistance, institutional inefficiencies including a lack of oversight or legislative measures to prevent corruption, and the ambiguous actions of temporary employment agencies. Participants also mentioned that there is no real possibility for integration, as most of the people working in agricultural enterprises are temporary labour and tend not to settle in the territory, which means that new, non-integrated migrants are constantly replacing integrated ones. As a result, it is imperative to intensify efforts to settle migrants. Additionally, there is a need to address the rise in rents and other basic costs brought on by a perverse "business model" that takes advantage of immigrants by overcharging them for housing in addition to their entry into Portugal. This new "market" is causing homes and even commercial facilities to be diverted to accommodate migrants.

Other weaknesses mentioned were the lack of support, disempowerment, and insufficient mechanisms to access and control land and resources for small-scale and/ or traditional producers. The continued disinvestment in local services/ infrastructures and the monopolisation of investment for transnational agribusinesses have established a trend of privatisation and mismanagement of natural resources. These power asymmetries have created a lack of long-term vision, prioritising market needs, thus generating a loss of collective mechanisms, weakening or eliminating the democratic control of producers and other food actors over their food systems—i.e., their food sovereignty—and increasing land abandonment.

In terms of the agro-territory's opportunities, three dimensions emerged:

- **Climate dimension:** Climate change can be considered an opportunity to foster improved and healthier relations with food production, such as developing strategies for rain-fed agriculture or experimenting with desalination, counter desertification processes, and taking advantage of Odemira's two production seasons.

- **Environmental dimension:** Participants identified three groups of opportunities, namely (i) increasing R&D (e.g., environmental impact assessments, Odemira as a regenerative laboratory, independent research on soil and marine life, investing in and developing social technology opportunities, empowering and modernising small/traditional farms to realise new production models based on dialogue and cooperation); (ii) three R's—recovery, requalification, and reconversion (e.g., requalification of the greenhouse zone, reconversion of the eucalyptus monocultures into biodiverse forests, recovery of water lines); and (iii) conservation (e.g., creation of a fishing reserve).
- **Socio-economic dimension:** Participants identified opportunities for fostering a more inclusive, sustainable development for the region. Undeniably, agricultural systems can horizontally produce wellbeing. In order to democratise local food systems, some critical adjustments must be made, such as funding for rural regeneration projects, support for smallholder traditional as well as sustainable farmers, promoting local markets, or implementing community-supported agriculture. Similarly, it was suggested that local producers needed to feel more empowered, especially those who wanted to produce in a more sustainable way. This could be achieved by promoting alternative education that combines traditional and contemporary knowledge of food systems, such as traditional seed preserving methods and decentralised on-farm solar energy generation. Ideally, this would entail engaging in dialogue with the different players in the food chain, including multinational corporations and civil society organisations. The need for establishing safety measures, such as a mandatory fund for dismantling intensive farming operations in the case of bankruptcy, including the plastic greenhouse structures, was also emphasised. Lastly, the prospect of sustainable tourism was discussed, such as that proposed by the regional community-based initiative "Rota Vicentina".

The major threats identified by the workshop participants and interviewees related mainly to socio-economic, political-democratic, and environmental issues. Specifically, they pointed out threats related to neoliberal economic globalisation, neo-feudalism, and gentrification, such as the vulnerability of migrants, lack of protection mechanisms for and marginalisation of small-scale farmers and other traditional producers, corruption in power positions, and the erosion of traditional knowledge and practices. The latter is an indication of how a market paradigm that favours monocultures, intensive farming, mining, and gas and oil exploration has transformed society. The workshop participants further identified the following threats as being extremely problematic: the dominance of eucalyptus, an invasive but lucrative tree species; the exclusion of small-scale farmers from water irrigation systems; the danger of plastic contamination; and the loss of fertile soil, seeds, and biodiversity.

The identification of weaknesses and threats supported the next step in the exercise, where participants were asked to identify and then rank the principal problems in Odemira's food and agricultural systems according to their perspective. This resulted in the following ordinal list:

1. Dominant neoliberal/capitalist political vision.
2. Lack of articulation between small farming, local development associations, and other public institutions.
3. Planned disarticulation between policy and territory.
4. Non-recognition of the social and ecological functions of the earth and nature.
5. Commodification, e.g., common goods transformed into merchandise (water, soil, seeds, food).
6. Disempowerment of the rural ways of life.
7. Collusion with agribusiness and corruption by local authorities.
8. Dominance of the monoculture model.

This prioritisation is in line with the conclusions of the baseline study presented in Section 3.1.

In closing, participants were asked to delve deeper into the top three problems, pointing out what, in their view, were the major causes and consequences for each of these. These so-called problem trees are presented in Figures 4–6, respectively, and mirror the conclusions of the SWOT analysis as well as the baseline analysis of Odemira.

A central idea that emerged from the workshop was that the region's recent transformation could be attributed to its increasing specialisation in export cash crops, implemented within a large-scale intensive industrialised monoculture approach, which is supported by subsidies and dominates the use of resources in the region, such as soil, water, biodiversity, but also housing, commercial spaces, and the job market. At the same time, small-scale farmers experience a lack of technical support and bureaucratic obstacles to getting their products to market, and are excluded from democratic participation in the discussion of the territory's governance. It is clear that other food actors, whether local associations or local politicians, also lack the democratic and legal mechanisms to invert the tendencies in their territory. The relatively rapid growth of the agro-industry has had severe socio-economic and environmental consequences, among them the uncontrolled flux of migrants who live in less than optimum conditions, the upward pressure on housing and other prices, the depletion of water sources, loss of topsoil, habitat destruction, and a significant decrease in biodiversity. These dynamics have resulted in a feeling of growing social injustice and growing inequality, with wealth concentrated primarily in those benefiting from the new market model,

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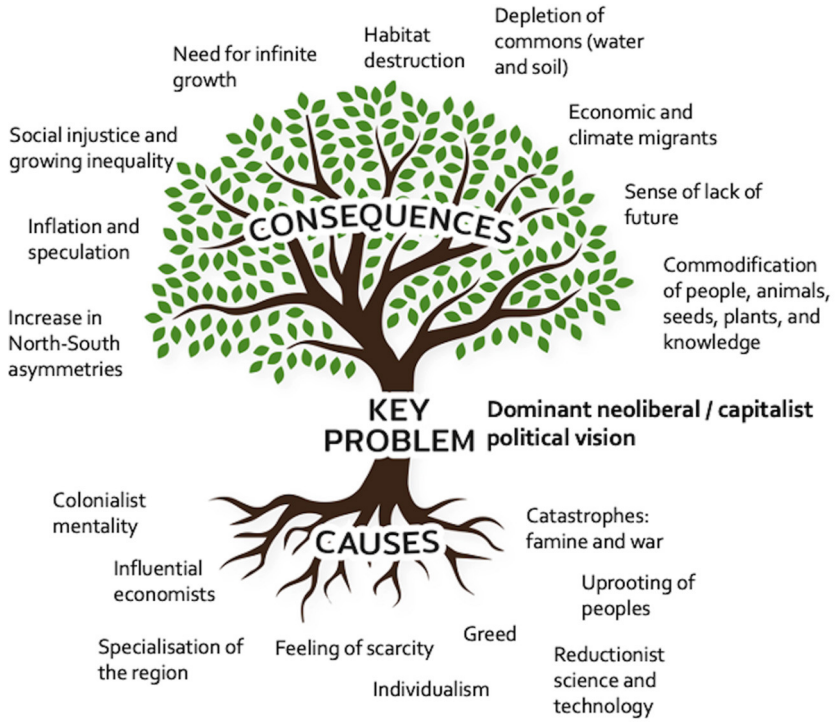

FIGURE 4
Problem tree 1—Dominant neoliberal/capitalist political vision.

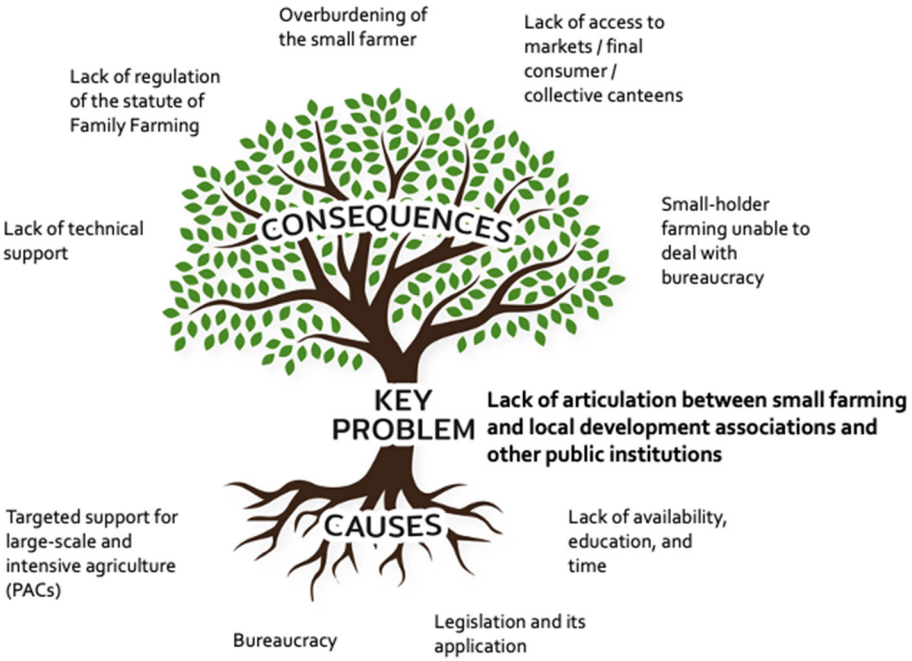

FIGURE 5
Problem tree 2—Lack of articulation between small farming and support institutions.

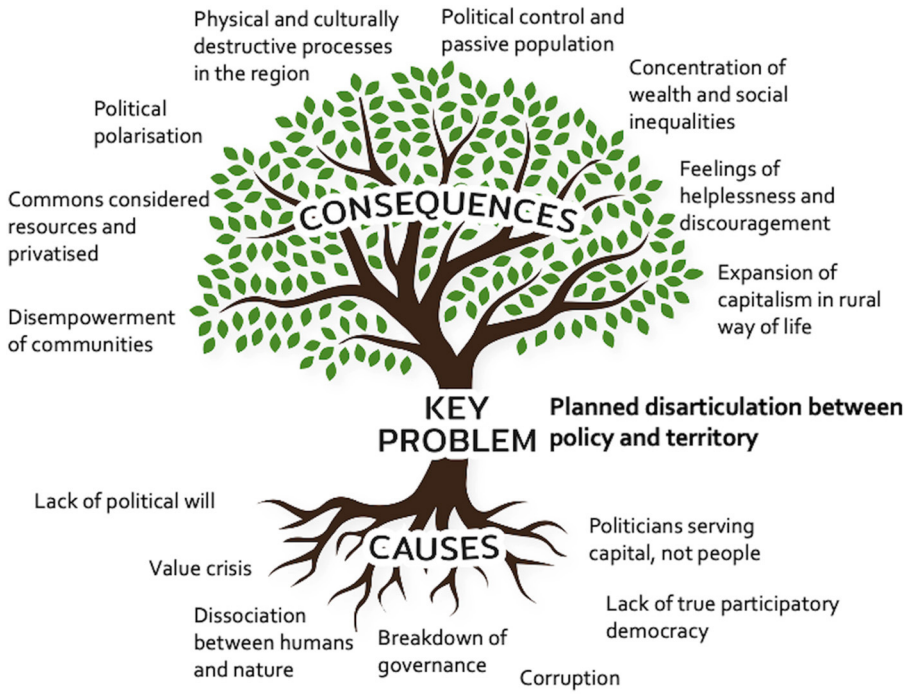

FIGURE 6
Problem tree 3—Planned disarticulation between policy and territory.

further deepening a sense of discouragement and of a lack of future.

4. Discussion

The agro-territory of Odemira is affected by stressors from climate change, including drought, water scarcity/pollution, and soil loss, as well as the consequences of political abandonment and power imbalances, as discussed throughout this paper (lack of infrastructures, lack of job opportunities, the dominance of large-scale monoculture development, deficient migrant integration, inadequate democratic mechanisms such as the lack of inclusion of residents in land and water management).

In addition, we argue that Odemira represents the contemporary clash of agricultural models in Europe, as evidenced by the tensions listed below:

- The marginalisation of small-scale family farmers who are increasingly facing disempowerment and even extinction.
- Heavy investment and political support for large-scale hyper-intensive agrarian projects, to the detriment of small-scale as well as sustainable farming systems.
- Upward pressure on rents and other prices.
- De-development in light industry and services.
- Conflicts over land and water management.
- Human rights infractions, e.g., exploitation of migrant workers.

The combination of these multiple stressors and tensions results in what we have termed "depressed and contested" agro-territories, where we find not only socio-economic and ecological distress but also political conflict over scarce resources, resulting in disempowerment and diminished food sovereignty of rural communities.

This study found that farming practices trumped farming conditions. Overall, farmers in the intermediary and interior zones, despite having more challenges, had very similar and reasonably good scores on most criteria, with a slight advantage for intermediary zone farmers, who have better access to infrastructures, markets, and consumers. Farmers from the coastal zone, despite their superior edaphoclimatic and infrastructural conditions, scored lower on almost all the 10 sustainability criteria than farmers in the interior and intermediary zone, mostly due to their choice of production system: intensive with high external, synthetic inputs. Although farmers in the interior were generally poorer and had worse working conditions (suffering the highest water stress), their isolation favoured the generation of inputs on the farm and a higher range of diversity of animals, trees, and crops, making them more efficient, and better at recycling nutrients and creating synergies within their production system.

Proto-agroecological farms were shown to hold the highest scores overall. Even though these production systems would benefit from better integration of animals and wider crop diversity, these farmers are nevertheless the most consistent, adaptable, and likely to achieve a successful and multi-dimensional transition towards socially and ecologically sustainable farming systems. The farmers in these production systems tend to be younger (often neo-agrarians, often foreigners), with higher education, have access to knowledge-sharing mechanisms, favour direct relations with their customers, and have better seeds and breeds management, choosing climate-resistant varieties that support land regeneration, flora, and fauna. These farmers were the most empowered of the non-industrial typologies. Their capacity to network and defend their democratic rights gives them an advantage over the traditional farmers. At the same time, their often-innovative farming practices (e.g., agro-forestry, market-garden) constitute a model to replicate to build resilient, healthy, and viable food systems. This typology shows the most promise of championing food sovereignty in depressed and contested agro-territories.

Traditional farmers showed a strong identification with the rural identity and the land, and most had not forgotten (although not always applied) sound ancestral practices. But for the most part, these farmers were the most fragile: in general, they were older, had less education, were more isolated, lacked integration in organised networks (often not by choice, but for lack of initiatives in their area), worked under harsher conditions, and were subject to more precarious land ownership situations. Since enhancing the welfare of traditional farmers, who make up the majority of farmers in the region, will typically also enhance the welfare of the rural people, any interventions in Odemira's food and farming systems must take these actors into consideration. On the coastline, however, it is crucial that steps be taken to supervise the working and living conditions of migrant workers in the berry industry, as well as reinforce infrastructures and institutions, since these workers currently are overtaking the population of coastal towns in numbers.

The results of this collective assessment and reflection with key food actors in Odemira underscore the asymmetries that result from divergent visions for Odemira's agri-food future: one that supports and modernises small-scale and traditional farming within healthy, collectively managed agroecosystems and another that sustains the expansion of intensive industrial agriculture, boosting profits for some, creating burdens for everyone else. Food actors in this study strongly favour the empowerment of actors left behind in the industrialisation of Odemira's food and farming systems, as well as the diversification of crops, the regeneration of lands, the fusion of ancestral and modern practices, and alternative economic arrangements that favour smallholder farmers. They see a need for an ecological as well as democratic systems change, from reconnecting with nature and respecting the limits imposed by the local realities to exploring further sustainable development mechanisms based on human rights protection, community empowerment, social justice, and the redistribution of wealth. Food sovereignty is the best paradigm to help realise these democratic attributes: by placing food system governance with those actors that not only benefit most from them but are also the first to suffer the consequences from their mismanagement.

The results show that Odemira's principal actors favour a different model of development, cooperative rather than competitive, sustainable, democratic, and solidary, rather than industrialised and elitist. They believe such an economic model produces more widespread benefits, with more job diversity, career opportunities, civil society involvement, and wealth distribution. A more diverse food and farming system would spawn a wider variety of businesses and services both at the input as well as the output level, rather than the current industrialised system, which operates entirely independently from the agro-territory, concentrating wealth at the level of capital-holders, while leaving the territory to deal with the many externalities.

5. Conclusion

The present study focused on the plight of depressed and contested agro-territories in Europe, using the example of the region of Odemira in Southwest Portugal. We defined depressed and contested territories as areas that:

1. suffer from pervasive socio-economic and ecological distress due to factors such as climate change and over-development followed by de-development and political abandonment;
2. simultaneously are the object of competing developmental and market models.

In answer to the study's research questions, the results firstly established Odemira's main challenges and its status as a depressed and contested territory. Odemira is particularly impacted by climate change, experiencing rising drought, biodiversity loss, loss of topsoil, and depletion of water sources. Also, the territory has little to no resilience to mitigate these effects due to decades of political marginalisation that caused disinvestment in crucial infrastructures and other services sectors. At the same time, all the available land, some of it located in protected areas, is being snatched up by agribusinesses operating in a hyper-industrialised model of farming. These activities are causing additional stress on common resources such as soil, water sources, health of (agro)ecosystems, but also the fragile infrastructures of the region.

Secondly, the analysis revealed that the primary sources of conflict in Odemira are the rapidly expanding hyper-industrialised farming ventures. This politically motivated large-scale industrial agriculture development, in combination with the persistent underinvestment in the services, infrastructures,

and technologies connected to smallholder and sustainable farming, are the primary cause of the deterioration of the socio-ecological and socio-economic circumstances in the agro-territory. Traditional, peasant, smallholder, and sustainable farmers are increasingly being cut off from access to markets, essential resources like water and technical and institutional support, having no democratic or legal mechanisms at their disposal to halt this assault. As a result, their financial returns are evaporating quickly. We observed the evident despair, concern for the future, and dissatisfaction with local and national authorities when we interacted with traditional farmers. Other local food actors complained that they felt their communities were being abandoned and vital rural infrastructures neglected. Sustainable farmers claimed they received little or no recognition for the ecosystem services their production systems provide.

Thirdly, the study collectively diagnosed the main factors feeding into and aggravating the agro-territory's challenges and tensions, which were deemed to be:

- The political support for a neoliberal capitalist vision for agriculture, placing it on a trajectory of hyper-industrialisation and hyper-specialisation aimed at the global markets.
- The parallel marginalisation and abandonment of small-scale farmers, whether traditional or proto-agroecological, leaving them out of decision-making and isolated from essential support structures (e.g., local development associations and irrigation sources). There are currently no democratic or legal mechanisms for these actors to influence decision-making on natural and institutional resources.
- The disassociation of national agricultural policies from the territory's actual needs and possibilities, particularly the inability to regulate savage farming practices, stop the privatisation of common resources, and regulate access to land.

No political solution has been proposed for Odemira's predicament despite international commitments (e.g., the UN's SDGs, the EU's Green Deal, mainly the Farm to Fork and Biodiversity strategies, the Eco-schemes under the new Common Agricultural Policy, and the Climate and Energy Framework), all of which require translation into national strategies and law. It is likely that Odemira will be unable to fulfil the objectives of SDG 2 (Zero Hunger), particularly when it comes to doubling the agricultural productivity and incomes of small-scale food producers until 2030, guaranteeing secure and equal access to land and other necessary inputs (target Section 2.3); and fostering sustainable food production systems through resilient agricultural practices (target Section 2.4).

At the same time, the study showed that numerous opportunities exist to invert Odemira's current trend, provided investment and subsidies are diverted from hyper-intensive farming practices to smallholder, traditional, and proto-agroecological initiatives. With the proper support and a balanced blend of ancestral knowledge with modern regenerative techniques, the latter presents the best odds of reviving Odemira's communities, local economies, and agroecosystems.

In conclusion, Odemira's plight as a depressed and contested agro-territory stems mainly from severe deficiencies in food democracy and food sovereignty through the imposition of a dominant neoliberal market model, which excludes many essential food actors, mainly traditional but also proto-agroecological farmers, with an emphasis on women farmers, civil society movements, as well as the growing group of migrant workers, from deciding on the model they desire for Odemira's food future. This study asserts that for these groups to regain democratic control over food and natural resources is a precondition to attaining the sustainable development sought after by the EU, including the fulfilment of SDG 2 and the Farm to Fork Strategy.

Due to the contributions of local food system actors, this study's methodological approach is particularly adequate for the setting of multiply stressed agro-territories, being flexible enough to incorporate local specificities. It is suitable for simultaneously tackling structural injustice and agricultural (un)sustainability within the framework of agroecology and food democracy. On the one hand, it places the more vulnerable actors on centre stage and is specifically adapted to people with little formal education. On the other hand, it proves to be robust in assessing the performance of agricultural systems across multiple dimensions, using FAO's tool, TAPE, combined with collective reflection exercises.

The insights provided by this research can assist other European agro-territories in dealing with the ecological, political, and democratic tensions that derive from a focus on growth, profit, and upscaling through industrialisation rather than food sovereignty and the health and justice of local food systems. It becomes clear from this study that the "business as usual" approach in food and farming will aggravate the fate of depressed agro-territories, which will experience increasing pollution, water stress, land abandonment due to ageing and lack of opportunities for smallholder farmers, and the rapid deterioration of agro-ecosystems. Odemira's predicament as the epitome of the clash of agricultural models in Europe could serve as a baseline for other studies where disputes over land, water, and the choice of agricultural knowledge and practices are being discussed. The ways forward proposed by the Odemira agro-territory's local food actors are anchored in the joint frameworks of agroecology and food democracy, such as the regeneration of agroecosystems, redistribution of agricultural subsidies, implementation of policies of inclusion and political participation in decision-making on crucial, common resources (i.e., realisation of food sovereignty), and the maximisation

of wellbeing of the weakest elements in rural communities. With further research, their proposals could serve as a model for transitioning to a sustainable and just development of the agri-food sector.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study.

Author contributions

LH, KS, and ME: conceptualisation, research and tool design, data collection, data analysis, data visualisation, and writing, review and editing. LH and KS: writing original draft Sections 1, 2, 3.1, 3.3, 4, 5. ME: writing original draft Section 3.2. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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