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# A critical application of the Agroecology Criteria Tool to evaluate agri-food initiatives in Portugal

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## Abstract

Agroecology is being increasingly promoted as a pathway toward more sustainable agri-food systems, but its systemic and multidimensional nature makes agroecological assessment particularly difficult. While several frameworks have been developed to evaluate agroecological compliance, little is known about how agroecology is currently implemented and evaluated at the national level. This study examines 34 agroecological research and advocacy initiatives in Portugal using the Agroecology Criteria Tool (ACT), representing, to our knowledge, the first national-level application of a similar framework. The analysis shows that only a few initiatives considered fully adopt a systemic approach to agroecology, with most demonstrating only partial integration of the agroecological principles. Clear differences appear between types of initiatives: projects focused on agroecosystems tend to highlight ecological aspects, while food-system-focused initiatives mainly act as social and institutional facilitators rather than as leaders of comprehensive agroecological transformation. Meanwhile, applying the ACT reveals its usefulness and limitations, especially regarding overlaps among criteria and how elements are organized, which somehow restricts its ability to capture the dynamics within the groups of initiatives. Based on these results, we suggest targeted improvements to the tool to improve its clarity and usefulness. Overall, the study emphasizes the need for strong, transparent, and context-sensitive assessment frameworks to support evidence-based decisions and effectively guide the transition to agroecology.

**Keywords** Agroecology Criteria Tool, Portugal, Agroecological assessment tools, Sustainable agri-food systems, Agroecological transition

## 1 Introduction

The multiple sustainability-related limitations posed by the dominant extractivist and globalized agri-food system are well-identified [1–3]. The industrial and monoculture-based agri-food model, characterized by the concentration of power in the input and retail sectors [4], has contributed to livelihood loss, poorer diets [2, 5], and environmental degradation, including ecosystem and soil damage [4, 6–8]. This occurs alongside ongoing world hunger, which persists largely due to political choices rather than technical limitations [9]. Hence, the resolution of hunger and malnutrition relies on political will and more effective policy frameworks rather than solely on technological



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advancements [9, 10]. This reality has led to the conclusion that a structural and profound [4] transformation of the food system is necessary [2], supported by a comprehensive systems-thinking approach that can address the inherent complexity across the food system's different dimensions [5, 11].

Agroecology, as an integral and holistic response to food systems [14, 15], has consistently been regarded as one of the most comprehensive approaches to addressing global challenges, such as food supply, food quality, biodiversity conservation, climate change, and social justice [4, 12, 13]. Agri-food systems are complex, multi-dimensional, and adaptable configurations with various interdependencies among social, economic, environmental, and political factors [11]. Therefore, a holistic and transformative approach, such as agroecology, is crucial to managing the complexity and interactions within the system [16].

Despite the increasing recognition of agroecology as a transformative paradigm for sustainable food systems, there remains a lack of systematic evidence on how agri-food initiatives integrate its principles in practice. In Portugal, previous mapping efforts (e.g., Traece, AE4EU) have identified agroecological actors, initiatives, and networks; however, these studies did not assess the compliance with agroecological principles nor the capacity to drive systemic transformations. This gap makes it difficult for policymakers, practitioners, and researchers to evaluate the actual progress of the agroecological transition at the national scale. Therefore, a structured assessment using established tools is urgently needed.

Although initially coined in the early twentieth century, interest around agroecology re-emerged in the 1980s and 90s as the ecology of farming systems [17, 18], quickly evolving into the ecology of the entire food system [19]. By 2009, a consensus began to develop, considering agroecology as simultaneously a science, a practice, and a social movement [20], in which research should be conducted as a transdisciplinary, participatory, and action-oriented process [21]. By 2015, the second Nyéléni forum had established the core characteristics of agroecology [22], laying the groundwork for the global efforts led by FAO that defined the 10 elements of agroecology and endorsed it as an effective strategy for transforming food systems [23, 24]. Although some voices still argue that agroecology is a contested concept [12–15], its conceptualization has evolved tremendously, with its meaning and understanding maturing into a more coherent discipline over the last 15 years [15–18]. Today, the core concepts and ideas of agroecology, inherited from the FAO's 10 elements [19] and the HLPE's 13 principles [4], are widely accepted among practitioners, scientists, advocates, and policymakers [20].

However, although clearly conceptualized, one problem arises: agroecology may be well characterized, but how can it be adequately implemented and evaluated when it “covers multiple disciplines, can be applied at various levels (...), is context-dependent, and is used by many different stakeholders” [21]? Even more so, when it is “simultaneously addressing agronomic, ecological, cultural, socio-economic, and political aspects of food systems” [22]? In fact, assessing agroecosystems undergoing an agroecological transition poses several methodological challenges that need to be tackled [23]. Thus, it becomes clear that there is a need for comparable evidence on the multidimensional performance of agroecology in order to adequately assess initiatives and inform policy-making [24, 25].

Building on this necessity, several frameworks have been developed over the past few years [6, 22, 26] to characterize and measure agri-food initiatives and validate them regarding their agroecological quality and functionality<sup>1</sup>. In fact, this need for holistic assessments capable of adequately validating the multidimensional sustainability performance of agri-food systems has led to the proliferation of measurement tools while contributing to the acceptance of agroecology [6, 25, 27, 28]. The holistic nature of an assessment necessitates that the entire system be evaluated, encompassing its environmental, social, and economic components, as well as their related interdependencies. Designing a holistic assessment tool for agri-food systems poses a substantial challenge, raising several methodological difficulties [23]. Indeed, for an assessment to be deemed holistic, it should exhibit four notable characteristics: (i) guarantee multi-dimensional analysis, (ii) inclusion of multiple perspectives, (iii) evaluation of synergies and trade-offs within the system, and (iv) capture of emergent properties only observable at the system scale [6, 29].

It is also important to note that some of these tools have been designed not only to check for adherence with agroecological principles but also to evaluate the performance of agri-food systems from a holistic and systemic perspective—what Geck et al. [22] differentiate as “the degree of agroecological integration” and “the performance of agroecology”. These holistic assessment tools contribute to creating a level playing field, able to allow adequate comparisons between agroecological initiatives and conventional agri-food systems [6, 29]. Another variation among the existing tools is the extent to which they can assess different scales (from the field to the food system) or include various components of the agri-food value chain [6].

### 1.1 The role of assessment tools in agroecological transitions

To adequately classify a food system as agroecological, it is essential to clearly define the true meaning of agroecological quality so that its benefits can be captured through a holistic measurement of its outcomes [30]. Evaluating performance based on all variables—not just production or financial outputs—helps reveal hidden impacts and contributes to better informed decision-making. Creating such a level playing field is crucial, as the actual cost of food is often overlooked in policy and corporate decisions. These hidden impacts may include both negative and positive externalities, such as the production of ecosystem services [5]. In this regard, assessment tools play a central role in making agroecological processes and outcomes visible and comparable.

The capacity to measure the quality and functionality of agroecology strongly contributes to the agroecological transition, understood as “the transition from productivity or efficiency/substitution-based to biodiversity-based agriculture at the local level” [31]. Agroecological transitions involve the *ecologization* of agri-food systems through systemic transformations by engaging multiple stakeholders and encompass changes in practices and organizational arrangements [32]. To support such transitions, assessment tools must capture complexity, guide learning processes, and support data-informed decision-making across scales.

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<sup>1</sup> We assess agroecological transformation through two complementary lenses: quality—the extent to which ecological integrity, social justice, cultural rootedness, and political autonomy permeate practices and values—and functionality—the system’s capacity to drive change, gauged by its coherence, resilience, governance strength, and ability to reproduce and scale transitions across territories.

However, current approaches to assessing agroecology present significant limitations. This lack of clear and shared criteria to identify and evaluate agroecological systems is problematic because: (i) it inhibits the classification of systems as agroecological and limits the ability to quantify their benefits or disadvantages; and (ii) it often relies on reductionist evaluations that fail to capture systemic interactions [12]. While the 13 principles of agroecology [4] provide a useful starting point, their application as a framework based on individual components does not, by itself, ensure the holistic, participatory, and action-oriented systems approach required for agroecology. As a result, traditional tools frequently fall short in assessing the multidimensional performance of agroecological systems.

Several frameworks have been developed to address these gaps, including True Cost Accounting (TCA), initially developed by TEEB Agrifood [33], which explicitly aims to measure the hidden impacts of agrifood systems [34]. Such approaches highlight the need for harmonized, comprehensive assessment frameworks that capture environmental, social, economic, and territorial dimensions in an integrated manner, thereby better supporting agroecological transitions [35].

The improvement of the assessment frameworks also impacts policy and scientific recommendations. Ensuring compliance with agroecological principles, in both policies and practices, requires appropriate monitoring and evaluation mechanisms. This is well emphasized in the 2021 report by the Committee on World Food Security, which recommends to “establish, improve and apply comprehensive performance measurement and monitoring frameworks” [36]. Robust assessment tools can also support the scaling-up of agroecology through institutions and the scaling-out across territories [37], by helping funders, advocates, practitioners, and policymakers make informed, evidence-based decisions [38].

At the European level, the need to better measure and communicate the benefits of agroecology has been widely acknowledged, particularly to overcome regulatory and political barriers to agroecological transitions [21, 36, 37]. Since 2018, several initiatives have sought to map agroecology across Europe, initiated with the work from Wezel and colleagues [14] and culminating in the Agroecology for Europe (AE4EU) project, which published two volumes documenting agroecological initiatives in most European countries [36, 37]. While these mapping efforts provide valuable overviews to inform European and national policies, they have largely relied on exploratory interviews, documental searches, and literature reviews, without applying standardized assessment frameworks to validate the agroecological quality and functionality of the initiatives.

## 1.2 Objectives

Agroecology is increasingly recognized as an inspiring pathway toward the sustainability of agri-food systems [3, 39]. Consequently, a thorough characterization of existing agri-food initiatives is essential to understand whether a country is progressing toward an agroecological transition. Previous initiatives, namely the Traece and AE4EU projects, sought to map agroecology in Portugal [40, 41]. While both projects contributed valuable insights by outlining the general status of agroecology in the country, their specific scopes and methodologies limited their ability to provide a comprehensive picture, particularly in terms of representing the national reality in a balanced way and assessing compliance with agroecological principles. The Traece project focused primarily on

politically active neo-rural contexts, whereas AE4EU supported its interviews mainly with research labs, leaving other important dimensions insufficiently explored. Portugal is not known for being a prominent territory in agroecological research and discussion, with a clear lack of specific research infrastructures and nationwide institutes that represent the movement. The number of publications in agroecology from the country is also very scarce. The best examples are grassroots experiences, and only recently (from 2023), a coherent national network started to emerge, having already organized the International Congress of Agroecology (2024) and with the European Agroecology Forum scheduled for 2027. In short, although still lagging behind other European countries, the national agroecological movement appears to be gaining momentum.

To measure agroecological compliance and quality, scholars recommend either adopting an existing assessment framework—ideally selected from a pool of available tools – or developing a new one when necessary [6]. In this study, we apply the existing Agroecology Criteria Tool (ACT) toolkit developed by the Biovision Foundation, a choice based on previous reviews that analyze and classify agroecology assessment tools according to their suitability in terms of scale and type of analysis [22]. ACT is categorized as appropriate for assessment at the project or portfolio scale. Although several other tools are available for this type of characterization [22], ACT stands out as one of the pioneering frameworks; it is well-tested, readily available, and offers a particularly accessible and user-friendly structure.

This study aims to characterize agroecological initiatives in Portugal and to critically assess their quality and functionality using the ACT, while also evaluating the tool's suitability for guiding future application. To achieve the primary objective of assessing agroecological quality and functionality within Portugal's sustainable agri-food movement<sup>2</sup>, we examined agroecological projects and related research and advocacy initiatives. The focus of the study is on the current landscape of agri-food initiatives operating at the intersection of science and sociopolitical movements. Grassroots and farming practices themselves are not covered here.

In addition to providing an overview of the current state of the agroecological movement in Portugal, this study also contributes to ongoing discussions on the development and harmonization of agroecology assessment tools. Accordingly, we pursue a twofold objective: first, to highlight the current state of agroecology development in Portugal; and second, to critically apply the ACT framework to assess its adequacy for this purpose.

Therefore, the study addresses the following research questions:

- (a) What are the main research and advocacy projects that can be identified within the agroecological agri-food movement in Portugal?
- (b) To what extent do these initiatives comply with agroecological quality and functionality, and how do they contribute to the agroecological transition?
- (c) How adequate is the ACT tool for assessing agroecological quality, and how could it be improved?

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<sup>2</sup> We use the word movement in a wide context: a group of stakeholders organized towards a common goal (in this case, the agroecological transition). It is related to the conception of agroecology simultaneously as a science, a practice, and a movement [42], but it is not limited to the movement from civil society. We interpret the movement in a broader sense as coming from researchers, civil servants, local authorities, and other interested stakeholders.

To address these questions, we compiled a list of potential agroecological research projects and related advocacy initiatives and evaluated them using ACT. To our knowledge, this study represents the first attempt to provide a national-level overview of agroecology based on a systemic assessment using an established evaluation framework.

2 Methodology

Collection and organization of the information were carried out in two main steps: (1) building a list of projects and initiatives potentially representative of the agroecological advocacy scene in Portugal, and (2) characterizing the agroecological quality of those initiatives using the ACT toolkit.

2.1 Building a list of initiatives and grouping them into typologies

The list of relevant initiatives<sup>3</sup> was compiled following the first author’s participation (both in-person and online) in a series of events regarding sustainable farming and food systems held in Portugal in 2022 and 2023. Our role was generally that of a non-participant observer, and the events, totaling 18, covered a series of workshops, seminars, webinars, and conferences, most of them involving a national scope. These were organized by graduation courses, CSOs (such as producers’ organizations, competence centers, and civic movements), and local authorities. Moreover, some were held by organizations with an international reach, and some were also part of ongoing projects activities.

After screening the list of initiatives presented at these events, initiatives were included if they aligned with levels 3–5 of Gliessman’s transition framework [42] (see also Table 1), indicating intent of transforming the food system. The approach here was very straightforward: is the initiative bringing some efficiency gains while maintaining the status quo, or is it searching to innovate to transform the current system? As mentioned earlier, grassroots or farmer-led practices were excluded because the few examples available at events are too limited to represent the spectrum of agroecological activity in the country; therefore, only research and social movements were included. Once the list of initiatives was finalized, an early matrix was created with information for

**Table 1** Interrelation between the 5 levels of agrifood systems transition and the 10 + elements of agroecology. The socioecological and scale impacts of the different levels are also portrayed. Adapted from Gliessmann [44] and Wezel et al. [15]

| Socioecological impact | Level of transition to sustainability                                          | Scale impacted       | Element of agroecology               |
|------------------------|--------------------------------------------------------------------------------|----------------------|--------------------------------------|
| Transformational       | 5 - Novel global food system (participation, democracy, fairness, and justice) | Food system level    | Responsible Governance               |
|                        | 4 - Connections between producers and consumers–alternative food networks      |                      | Human and social values              |
|                        |                                                                                |                      | Co-creation and sharing of knowledge |
|                        |                                                                                |                      | Culture and food traditions          |
|                        | 3 - Redesigning the agroecosystem                                              | Agroeco-system level | Circular and solidarity economy      |
| Resilience             |                                                                                |                      |                                      |
| Diversity              |                                                                                |                      |                                      |
| Synergies              |                                                                                |                      |                                      |
| Incremental            | 2 – Substituting conventional inputs and practices                             |                      | Regulation and balance               |
|                        | 1 - Increasing the efficiency of input use                                     |                      | Recycling                            |
|                        |                                                                                |                      |                                      |

<sup>3</sup> Following related studies, we use the word initiative in a broad sense “as a formal action led by an organization towards agroecology” [43], including projects, programs, social movements, or research projects.



each initiative/project (Supplementary File 1 is a curated version of this list). If doubts about their transformative approach remain, further screening of the initiative's website information was conducted. In this table, partner organizations for each initiative were identified, contributing to the final list by gathering new data from these organizations. This snowball approach led to the growth of the initial list, as some organizations promote other relevant initiatives that were not captured in the first search from the events.

The grouping of the initiatives into three typologies stems from a recent literature review regarding territorially embedded agri-food systems in which agroecological research is typified into three groups [20]: (i) initiatives focused on agroecosystems, typically corresponding to the socio-territorial scale of field and farm (at Gliessman's framework represented by level 3); (ii) holistic approaches that encompass most aspects of agroecology, aligning with the community or landscape dimensions (Gliessman's levels 3, 4, and 5); and (iii) initiatives addressing the food systems, generally corresponding to regional or national scales (Gliessman's levels 4 and 5). Following this classification, we grouped the 34 listed initiatives (Supplementary File 1) into the three typologies described above. The grouping was conducted after screening each initiative, its goals, and expected results. The purpose was to group the initiatives based on their similarities to allow separate cluster analyses from the ACT tool.

## 2.2 Assessing agroecological performance with the ACT

The ACT tool was developed by the Biovision Foundation and is accessible online through Biovision's Agroecology Infopool platform (<https://www.biovision.ch/infopool/tools/act-agroecology-criteria-tool/>). In there, we can read that this "methodology provides a structured and graphically intuitive way to identify the focus and agroecological character of an initiative". Most of the following information can be found in the ACT user guide, at [https://www.biovision.ch/wp-content/uploads/2025/03/Infopool\\_ACT\\_User\\_Guide.pdf](https://www.biovision.ch/wp-content/uploads/2025/03/Infopool_ACT_User_Guide.pdf). The available Excel file enables scoring of individual projects with a binary scale of Yes or No. It utilizes 62 criteria across all '10 plus' elements of agroecology, as defined by the FAO [19]. The ACT framework has a plus version that adds an 11th element—Regulation and Balance. The 11 elements are arranged according to the five-level transition framework [44] (Table 1), with several evaluation criteria assigned to each element. Examples of practices, systems, and topics are provided for each criterion to help illustrate its meaning. The ACT tool allows users to generate results for individual initiatives or groups of initiatives (Supplementary File 2 presents the charts with results for the individual initiatives). The results are shown as a radar chart displaying precise percentages of agroecological compliance for each element. For clusters of initiatives, results are also shown in a radar chart, but they differ significantly. A project with only one positive criterion in a given element will contribute positively to the total of that element; all criteria in an element would need to score zero for the initiative not to positively influence the average. For example, a cluster of  $n$  individuals will score 100% in a given element if every subject has just one positive criterion in that element. This demanded close attention to both individual and cluster scores, which led us to present two charts per cluster. A first with the pre-defined methodology and a second by applying a 20% minimum threshold for an initiative to score positively in an element.

As established in a previous report that helped develop the ACT framework [30], initiatives can be classified as “not agroecological”, “agroecological”, “social enablers”, or “systemic”. Initiatives positively complying just with levels 1 and 2 are considered not agroecological (they still promote the “dominant external input-intensive system”); initiatives complying only with level 3 are considered agroecological; those complying with levels 4 and 5 are seen as “social enablers”, and only when levels 4 and/or 5 are positively achieved along with level 3 can initiatives be regarded as “systemic”.

Another feature for the individual scores is that getting as close to 100% as possible is not necessarily better than achieving a lower percentage, particularly regarding levels 1, 2, and 3. These levels have many criteria, and if a system complies with a very “robust” agroecological criterion (such as agroforestry or holistic grazing), it may score negatively in “other solutions.” Similarly, it could present a perfect example of nutrient recycling, and therefore, score *no* in the criterion “using biomass for energy generation.”

The web pages and documentation for each of the initiatives listed were thoroughly reviewed, which required an extensive search of documents related to the projects’ goals and activities, as well as their main outputs, such as reports and guides. This constituted the main method for data validation. A score (*yes* or *no*) was assigned for each criterion based on the available information. The ACT Excel file serves as a matrix where evidence for scoring can also be added; however, some subjectivity was inevitably involved in scoring the initiatives.

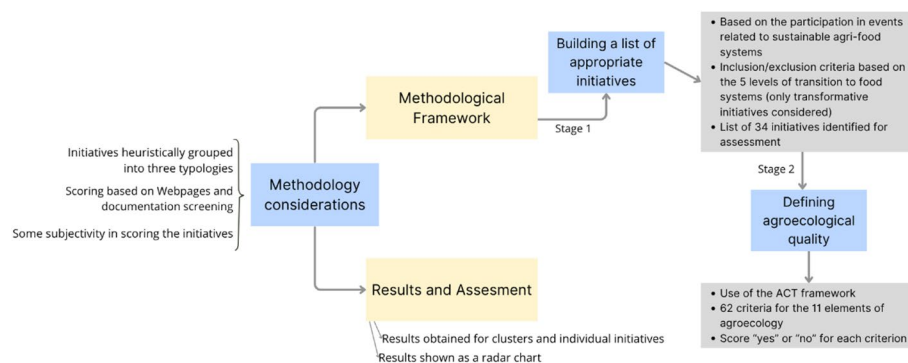
The methodological considerations here portrayed are summarized in Fig. 1.

### 3 Results

The sampling strategy used allowed us to identify 34 initiatives in Portugal (most of them projects) with apparent transformative agroecological potential. The complete list of initiatives, in Portuguese, is presented in Supplementary File 1. This section displays the results for each of the three typologies according to which the initiatives were grouped: agroecosystems, agroecology from a holistic perspective, and food systems.

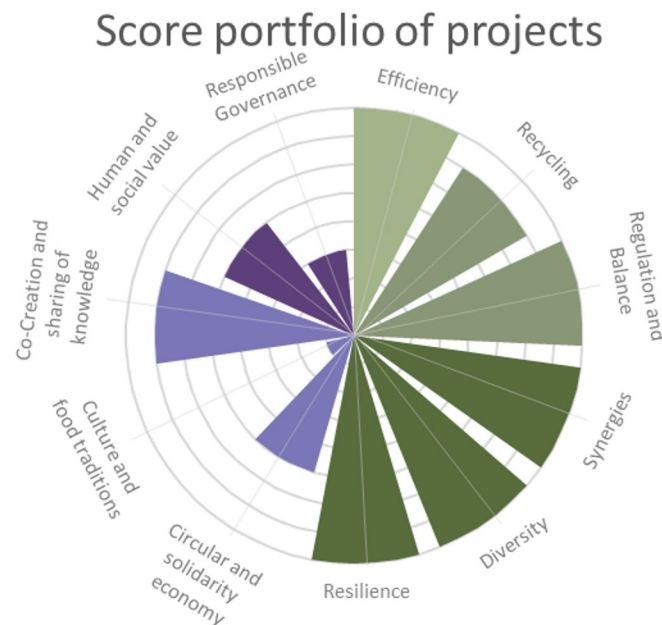
#### 3.1 Agroecosystems

Figure 2 presents the score for the cluster of the eight initiatives included in the agroecosystems’ typology. From the results obtained, and as expected, these initiatives are more



**Fig. 1** Methodological considerations. General methodological considerations are presented on the left side, indicating how the initiatives were chosen, grouped, and scored. The methodological framework is presented in two stages, with the methodologies used for each stage highlighted in the grey boxes. Finally, the results and subsequent assessment derive from the capabilities embedded in the ACT tool, particularly the ability to extract individual and cluster results





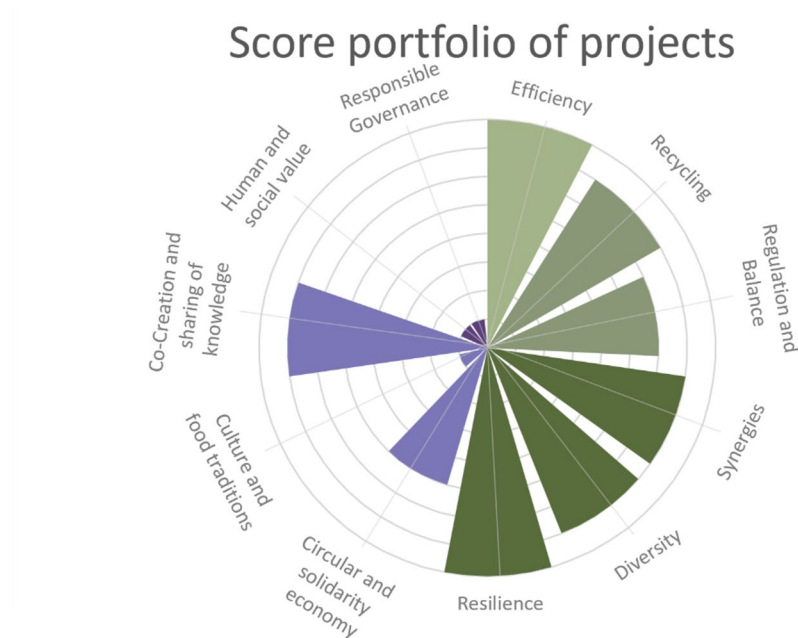
**Fig. 2** Scores of the projects in the “agroecosystem” cluster. The eight projects (each concentric line represents one project) present a high score in the elements related to levels 1, 2, and 3. They also perform well in the Co-creation and sharing of knowledge (level 4). As for the other elements related to levels 4 and 5, scores are poor, particularly when it comes to Responsible governance, and Culture and food traditions

compliant with the three levels related to the agroecosystems domain than with the two representing the food system (Table 1). Among the latter, only the element of Co-creation and sharing of knowledge scored well. Very low scores are obtained in the elements of Culture and food traditions, and Responsible governance, indicating a lack of attention for these dimensions, jeopardizing the holistic and systems approach needed for the promotion of a genuine agroecological transition.

As previously stated, an initiative scoring positively in just one criterion of an element suffices to contribute to the overall cluster score. These aggregated scores might obscure low compliance with certain components within the cluster. An examination at the individual project level (Supplementary File 2) indicates that the following elements scored equal to or below 20%<sup>4</sup>: Human values (in 80% of the initiatives initially scoring *yes* in this element), Responsible governance (in 66%), Regulation and balance (in 25%), Diversity (in 12%), and Synergies (in 12%). Implementing such a threshold alters the cluster profile, as depicted in Fig. 3.

Applying the 20% threshold almost eliminates level 5 and slightly reduces level 3 performance when compared to Fig. 2. This further reinforces that several of the selected projects remain poorly aligned with agroecological principles and are primarily focused on increasing efficiency without a genuinely transformative approach to the agroecosystem. On the other hand, the overall good score in Co-creation and sharing of knowledge is maintained (scoring *yes* in 7 out of 8 initiatives), which proves that most initiatives consider and engage farmers in their research activities, revealing a positive bottom-up participatory approach to their *modus operandi*.

<sup>4</sup> This is somewhat an arbitrary threshold. If an element has 3 criteria, then scoring *yes* just in one would immediately count for 33%. If it has 10 criteria, then scoring *yes* just in one would count for 10%. Therefore, a threshold was difficult to define, but we tried to give some consideration to the paradox of apparently high scores that were not supported by the individual results.



**Fig. 3** Scores of the projects in the “agroecosystem” cluster after applying a 20% threshold for each element

As a side note on these eight initiatives, the project “TransFarmers”<sup>5</sup> presented the highest score among the group, with positive scores in the food systems levels, thus placing itself better in the typology “agroecology from a holistic perspective” and showing that our initial heuristic grouping attempt was superficial and that the ACT tool provides us with a superior methodology. TransFarmers was an Erasmus+ project promoting exchange and good practices among almond and olive growers, covering producers from the Beira Baixa and Alentejo regions. It included two experienced Spanish agroecology organizations (Alvelal and Aland Foundation) as international partners.

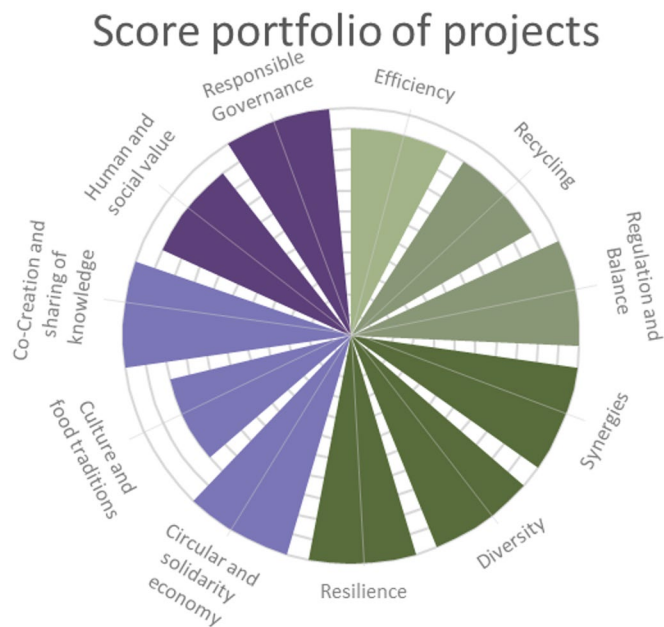
### 3.2 Agroecology from a holistic perspective

The results of the group of 11 projects in the typology of Agroecology viewed holistically (Fig. 4) align well with our expectations, with most of the eleven elements well accomplished. The notable exception relates to Culture and food traditions, which is somewhat concerning because it shows that even well-balanced agroecological initiatives are not designed with all agroecological principles in mind and still disregard relevant dimensions.

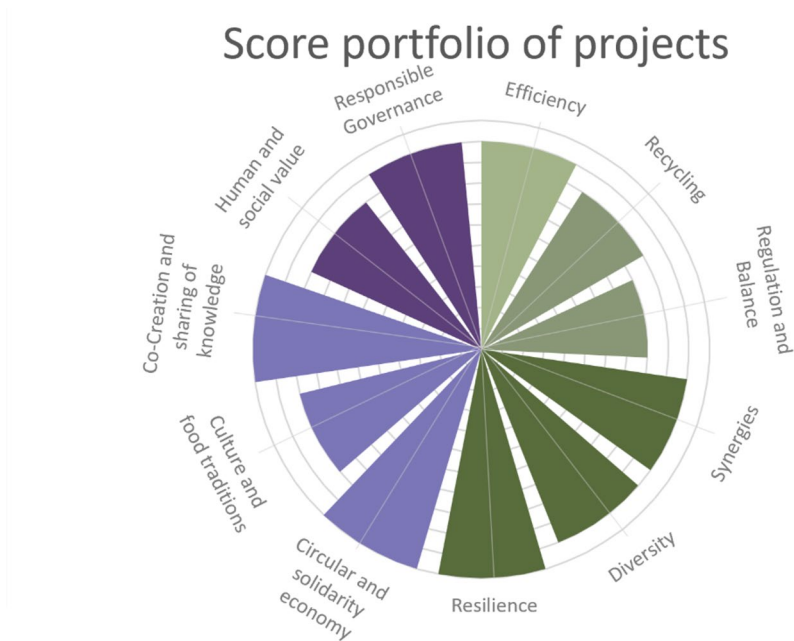
A closer examination of individual projects (Supplementary File 2) again highlights the need for careful consideration of the results. The element Regulation ranked below the 20% threshold in 27% of the initiatives, as did Synergies and Diversity, both in 9%. Stemming from such results, we can immediately realize (Fig. 5) that the elements relating to level 3 (redesigning agroecosystems) are not adequately internalized by all 11 initiatives considered, with a couple of initiatives functioning as outliers.

Several initiatives show a good all-around score and thus can be classified, in the language of the ACT, as *systemic approaches to agroecology* as they integrate the food system level (4 and 5) with an ecological agroecosystem perspective. It is the case of the

<sup>5</sup> <https://www.food4sustainability.org/transfarmers>.



**Fig. 4** Scores of the projects in the “agroecology from a holistic perspective” cluster. For these 11 initiatives, scores are evenly distributed. Only a few elements missed the highest mark, notably Culture and food traditions. At level 1, one of the projects was detected to miss the Efficiency criteria



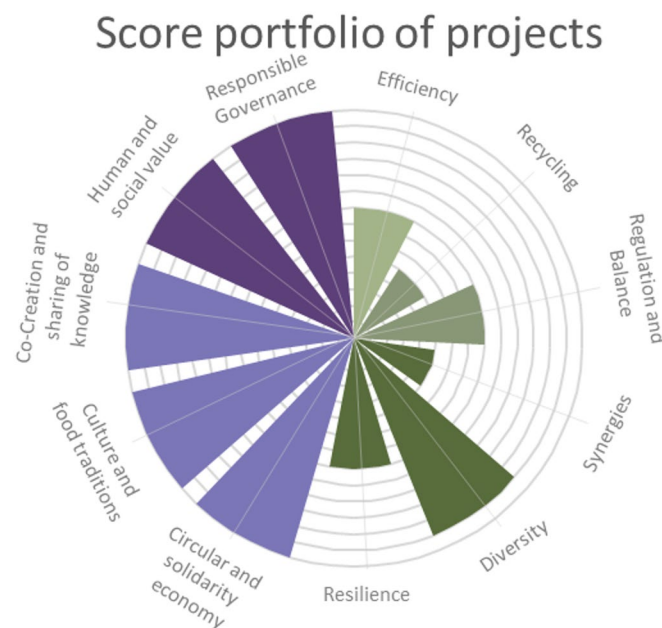
**Fig. 5** Scores of the projects in the “agroecology from a holistic perspective” cluster after applying a 20% threshold for each element

projects “Growlife”<sup>6</sup>, “Harvest”<sup>7</sup>, “MedCaravan”<sup>8</sup>, and the “FoodLink”<sup>9</sup> network. Growlife is a project under the EU Life program that constitutes an integrated approach to sustainable food systems through the promotion of behavioral changes across several groups of actors, from producers to policymakers. It works with 15 agroecological farms distributed across four municipalities in the country. Harvest is a project supported by the Portuguese recovery and resilience program and focuses on promoting vegetable gardens in urban, peri-urban, family, and community contexts. It links the promotion of healthy and sustainable diets with building consumer awareness and intervenes in several regions across the country. MedCaravan was an Erasmus+ project executed by a prestigious group of international partners. It was an agroecological educational project aiming at collecting, sharing, and training agroecological knowledge. The FoodLink network emerged from a previous Horizon project, becoming an autonomous entity aiming to promote the food transition in the metropolitan area of Lisbon following an approach we can consider proto-agroecological urbanism [45] or city-region food system [46].

In contrast, projects “SAL” and “Feast” act more as *social enablers* (using the ACT language) since they score well only at levels 4 and 5, which entails a singular focus on the food system dimension and a lack of attention to the agroecosystem.

### 3.3 Food system

Under the food system typology, all 14 initiatives achieved the maximum scores for levels 4 and 5 but fell short regarding the agroecosystem levels (Fig. 6), particularly level



**Fig. 6** Scores of the projects in the “food system” cluster. Results in this group show a clear tendency for complying with the elements of levels 4 and 5, but largely missing the agroecosystem levels. The exception here is Diversity, from level 3, which performs well

<sup>6</sup> <https://projetogrowlife.pt/>.

<sup>7</sup> <https://morecolab.pt/df480-neve-home/projetos/projetos-harvest/>.

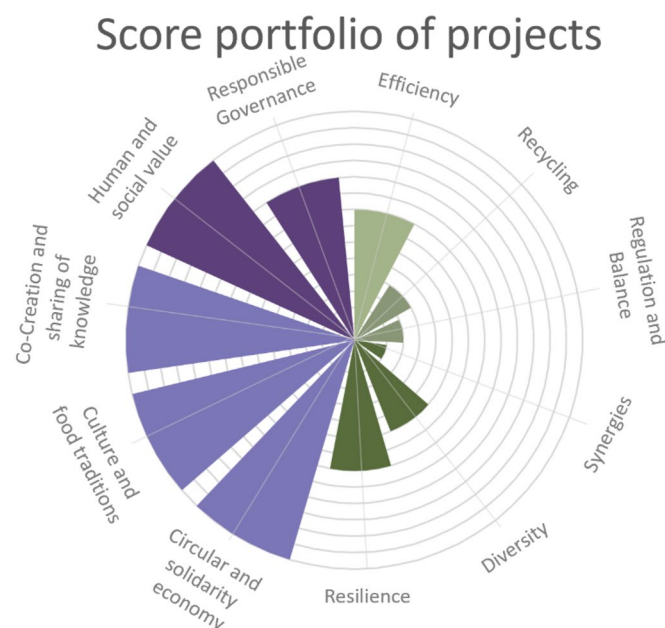
<sup>8</sup> <https://hub.urgenci.net/medcaravan/>.

<sup>9</sup> [https://www.ccdr-lvt.pt/wp-content/uploads/2023/12/FoodLink\\_Relatorio-atividades\\_2022\\_2023\\_27\\_11\\_2023\\_final\\_publicacao.pdf](https://www.ccdr-lvt.pt/wp-content/uploads/2023/12/FoodLink_Relatorio-atividades_2022_2023_27_11_2023_final_publicacao.pdf).

3, which holds more significant concern when pursuing an agroecological approach. Therefore, using the classification from the ACT report [30], one could consider these initiatives to act essentially as potential *social enablers*.

Analyzing the individual initiatives (Supplementary File 2), Diversity scored below the 20% threshold in 54% of the initiatives, Regulation in 62%, Synergies in 60%, and Responsible governance in 28%. With this result, levels 2 and 3 nearly vanish, and even the element of Governance appears poorly addressed (Fig. 7). We may conclude that some of these initiatives do not align well with the holistic view of agroecological principles. Additionally, we found several projects scoring the maximum in some elements while lacking a positive score in several others (even within the same level). This suggests that many initiatives take a siloed perspective, i.e., are highly issue-focused and, therefore, missing the holistic, systemic vision necessary to effectively respond to the challenges of the agri-food system.

We found the most agroecologically inspired projects in this cluster to be “FoodClic”<sup>10</sup> and “SPG”<sup>11</sup> (PGS – Participatory Guarantee System, in English) since they present highly fulfilled charts and, therefore, follow a systemic approach to agroecology. They could justifiably be moved onto the previous cluster (*agroecology from a holistic perspective*). The FoodClic project, funded by the EU and with a vast group of international partners, aims to promote integrated urban food policies for cities. For the Portuguese partner, this was executed by operationalizing the Foodlink network in the Lisbon metropolitan area. The SPG project, funded by the Portuguese Regional Development Program, elaborated a PGS toolkit for application among the producers of the *Prove* initiative, a national network of short supply chain food basket deliveries that has been running across the country for more than ten years.



**Fig. 7** Scores of the projects in the “food system” cluster after applying a 20% threshold for each element

<sup>10</sup> <https://foodclic.eu/>.

<sup>11</sup> <https://www.adreptes.pt/spg/>.

## 4 Discussion

This section is organized into three headers. The first adopts a more traditional approach, exploring the implications, opportunities, and limitations of the present study. The second presents our findings alongside previous literature to discuss the current state of agroecology in Portugal. And the third offers recommendations for the ACT tool, which is one of this paper's main goals.

### 4.1 Implications, opportunities, and limitations of the results

When screening the potential for agroecological transitions, the complex features of agri-food systems must be fully considered. Our goal was to determine to what extent the current movement in Portugal aligns with the fundamental qualities of agroecology, particularly in terms of holistic and systems thinking. We recall that the initiatives listed were selected for their apparent agroecological merits. The results, however, demonstrate only a partial alignment with the agroecological principles, and only a small set of initiatives were shown to be systemically transformative (in the language of the ACT), or agroecological from a holistic perspective, according to the typologies used in the clusters. For the most part, initiatives are overly focused on specific areas of the agroecological elements spectrum, leaving other equally important issues unaddressed.

One interesting insight from the results is that in the Agroecosystem cluster, not all projects scored well at level 3. This indicates they are not sufficiently transformative in their approaches, and as a result, the initial heuristic inclusion criteria for the initiatives were not entirely effective. Strictly speaking, initiatives that fail to reach level 3 should have been excluded from the set. The fact that the methodology allowed for a more precise evaluation of the initiatives is a positive inference from the study.

On the other hand, grouping the initiatives in three typologies improved the organization of the results, since the expected similarity between initiatives in each cluster allowed for a homogenization of results. However, as mentioned, that initial grouping was not always backed by our results since several initiatives fell outside of their allocated cluster. We see this more as a strength of the ACT tool than a limitation of our initial grouping. If we wanted to be extremely rigorous, new clusters could have been tested by regrouping the “outlier” initiatives. However, that was not the main goal here. Assessing a movement at a national scale is challenging, and even when producing cluster analysis with the ACT, the individual initiatives should also be carefully screened. Getting slightly different results in the clusters wouldn't make any difference in the individual performances.

It is also important to mention that similar tools could have been used here instead of the ACT. The German Agency for International Cooperation (GIZ) has developed an agroecological assessment and planning tool, adapted from ACT, with a scale score ranging from one to three or one to five. The Swiss Agency for Development and Cooperation (SDC) has also created an “agroecology marker” primarily for assessing its own projects. And finally, the tool from a consortium organized under the Agroecology Coalition [26], intending to create a harmonized framework using the 13 principles of agroecology and a scoring scale of three (zero, partial, total). All these tools fit the scale of project and portfolio initiatives [22] and would have been adequate for the present purpose. However, we believe that on-ground empirical validation of the criteria is highly required for tools with larger scoring scales. In our case, since the scoring was



allocated from analyzing the webpages of the initiatives, the binary scoring of ACT may have delivered fairer results.

One limitation of the study is the absence of an additional empirical step that would have involved lengthy interviews and other on-site data collection. Unfortunately, we lacked the resources for this. Additionally, the initiatives were classified based on information available on their websites, which introduces two more issues: some websites are much more detailed than others (potential source bias), and the scores were based on narratives—such as projects' goals and activities—rather than on actual results, deliverables, and outcomes (a possible validity gap). Essentially, this discussion is rooted in online information rather than on-the-ground facts. Regarding the subjectivity in the inclusion criteria for selecting these initiatives, we do not consider this a significant limitation. The ACT served as an effective screening tool, indicating that some initiatives could have been excluded from the selection. These findings give us confidence that the other excluded initiatives were unlikely to be transformative enough within the scope of this study. A final obvious limitation is that the study's results are not generalizable, as they are based on the methodology employed and do not represent the entire agroecological reality in Portugal.

Nonetheless, with this in mind, we identified a group of well-engaged initiatives in the various dimensions of agroecology that can therefore be viewed as actively promoting the quality and functionality of agroecology. We recommend that program and policy managers employ these tools of holistic assessment to evaluate the outcomes of the interventions and to identify the most promising examples for future policymaking [21]. This paper already presents a set of initiatives that scored well through the lens of the ACT, which could serve as examples of good practices. Additionally, the application of this methodology can highlight initiatives that may follow narratives, presenting themselves as highly sustainable and innovative, but only addressing isolated features in the system, rendering them unsuitable for contributing to the holistic transformation of the agrifood system.

We find the frameworks and toolkits recently developed for assessing agroecology to be of paramount importance, as they enable us to structure, implement, monitor, and evaluate policies aimed at enhancing the sustainability standards and performance of agri-food systems supported on agroecology. The application of the ACT toolkit in this study demonstrated that assessing initiatives by applying over 60 criteria effectively captures the degree of agroecological adoption for each of them. Policymakers and other decision agents should use these frameworks to design and apply more effective policy and project evaluation programs [47], guaranteeing alignment with agroecological principles and allowing a more robust approval, monitoring, and evaluation process. In the long term, the application of agroecological assessment toolkits can also help contribute to monitoring the evolution of the agri-food systems and their components. Therefore, this stands as the main conclusion of the study: agroecology assessment tools have the potential to help guide the application and monitoring of policies in any socio-territorial context engaged (or willing to) in an agroecological transition process.

#### **4.2 Further insights from the results**

Stemming from our results and related literature, we find the agroecological scenario in Portugal, regarding science and sociopolitical movements, to have a few engaging and

committed representatives. However, they are still operating on a marginal condition [41], making limited use of the term agroecology [40, 48]. A recent report depicting a general picture of agroecology in Portugal [49] also reinforced this idea. Below, we present key reasons that we have inferred to account for the limited presence of agroecology in Portugal. These are also presented in the aforementioned report as a SWOT matrix [49].

- (1) Initiatives remain dependent on short-term isolated projects, restricting continuity and limiting their policy impact. The results shown in Figs. 3 and 7 reflect this limited scope, which is also caused by limited public support for more holistic initiatives and a focus on short-term funding cycles. Literature increasingly highlights that this situation hampers the ability to design complex, holistic, participatory, and adaptable system changes [11];
- (2) Projects that are too tightly focused, missing the holistic complexity of reality. This was evident from the scores of many initiatives, and again, limits the adoption of a whole-food system perspective. Figures 3 and 7 prove just that, with many initiatives in the food system cluster unattending to agroecosystem's values and the initiatives in the agroecosystem cluster disregarding the food system ones. Moving from single projects to more complex portfolios as well as across organizations, devising interventions in a variety of areas in the system, could be an answer to this shortcoming [11]. Even if this situation is more a result of the funding programs than of the stakeholders' strategies;
- (3) Apparent lack of political commitment from the public sector. This situation is globally recognized and is hampering the agroecological transition. National governments are acting too slowly in this area, either due to the influence of the corporate sector [50, 51] or by ignoring the fact that food system change is a key lever for achieving sustainable development goals such as climate action [2];
- (4) Lack of cooperation among stakeholders, with initiatives, as far as we could see, working in some isolation. This issue was brought to light by initiatives tackling similar topics but developed in isolation [49]. It hampers the critical scale of the interventions and, consequently, their outcome and impact. The answer here can be intertwined with the limitation in 2: move to more complex portfolios across organizations;
- (5) Lack of technical skills to work with agroecological principles (both at the farm and food system levels). In Portugal, no genuinely agroecological education program was found [49]. Furthermore, investing in technical skills in this area requires revising existing agroecology education programs to include a *transformative learning* feature, in which students must engage as participant-actors in the agrifood system [52, 53]. Education is also linked to research, defined in agroecology as a transdisciplinary, participatory, and action-oriented process [54] that should also be managed as a complex discipline with constantly evolving research fronts [17];
- (6) Funding from the EU Common Agriculture Policy (CAP), which is, for the most part, destined for conventional approaches. Many stakeholders have noted this lack of political and financial support, with plenty of calls for the CAP to address the agroecological transition by more effectively supporting biodiverse agri-food systems [55, 56].

Alongside these hindering factors, a positive trend was also identified, demonstrated by the large number of potential agroecological initiatives considered (34) and the good

scores that seven of them obtained under the ACT assessment. We contend that these positive trends are related to:

- (1) The recent significant growth in initiatives and citizens committed to agroecology [40, 57]. This is in line with a global movement that is evidenced by numerous groups and advocates supporting localized food systems, family farming, agroecology, and the regenerative agri-food sector;
- (2) The role of the local authorities in promoting a myriad of relevant initiatives, with examples going from the use of targeted public procurement to the support for short food supply chains (e.g., local farmers' markets), as well as the promotion of education and awareness regarding the development of sustainable and healthy food systems [49, 58];
- (3) The availability of funding through several mechanisms and schemes. Although this is evident in the funding of the projects covered here, some challenges remain to ensure long-term approaches, i.e., the continuity of this work, or the ability to secure more substantial funding, typically associated with more complex European programs. Inevitably, the effective (and expected) reconfiguration of CAP would be pivotal here by allowing a greater flow of funding and support to agroecological initiatives;
- (4) The increased availability of recently produced reports, guidelines, and policy recommendations. We see this as an important asset that is not being adequately explored. We found several reports focusing on the promotion of sustainable farming practices [59], short food supply chains [58, 59], family farming [60–64], bioregions [65], and public procurement [66], usually comprising well-reflected recommendations for policymaking.

#### 4.3 Recommendations for the ACT tool

Several authors advocate the need for harmonized tools to determine whether initiatives can be considered agroecological [22, 27]. With the publication of the 10 elements [19] and the 13 principles of agroecology [4], it became possible to use more systemic features to measure the agroecological adequacy [22]. This more comprehensive approach also allowed breaking the complexity of agroecology into more tangible indicators. This is a work in progress [26] that takes to heart the agroecological principle of co-creation of knowledge, in which the contextual dimension of agroecological systems adds to the challenge. There is undoubtedly a need for harmonized comparable tools that are simultaneously flexible enough to incorporate the specificities of each place and situation [22]. We interpret this as an effort to gain global acceptance and recognition for the metrics used to evaluate agroecological initiatives. The Transformative Partnership Platform on Agroecology and the Agroecology Coalition are two entities that have been prominently working on this effort to propose harmonized frameworks to assess agroecology [6, 26].

The user guidelines<sup>12</sup> for ACT warn about interpreting the meaning of the results, which are context-specific, and the limitations for generating comparisons across different settings. Additionally, it also warns of the inability to evaluate outcomes or impacts derived from the products/outputs, along with the limitations of the binary score system (not allowing a relative degree of compliance) and the unavoidable user subjectivity. Agroecology assessment frameworks are helping to inform each other [22], and the ACT

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<sup>12</sup> <https://www.agroecology-pool.org/methodology/>.

**Table 2** Number of criteria in each element of agroecology as used by Agroecology Criteria Tool (own elaboration, from ACT Excel template)

| Element                              | Number of criteria |
|--------------------------------------|--------------------|
| Efficiency                           | 7                  |
| Recycling                            | 6                  |
| Regulation and balance               | 10                 |
| Synergies                            | 8                  |
| Diversity                            | 9                  |
| Resilience                           | 3                  |
| Circular and solidarity economy      | 3                  |
| Culture and food traditions          | 2                  |
| Co-creation and sharing of knowledge | 3                  |
| Human and social values              | 6                  |
| Responsible governance               | 5                  |

was already improved by the Agroecology Coalition with its *harmonized framework for measuring agroecology* [26]. Changes here include the use of the 13 principles of agroecology (instead of the 10 elements) and a scoring scale with three options (zero, partially, and totally). Although we agree with these alerts and recommendations, we would like to leave a few suggestions for improvement based on our study, which we expect can also be helpful for the debate on harmonizing the assessment tools. These suggestions are organized into three analytical groups: balance and coverage of criteria, precision and non-redundancy, and rationale of score aggregation.

#### 4.3.1 Balance and coverage of criteria

The total number of criteria appears to be too long (62), and not evenly distributed across the 11 elements, ranging from just two criteria for Culture and food traditions to ten for Regulation (Table 2). The criteria were primarily sourced from the results of previous research [67], particularly on the agroecosystem levels, which is a logical result of the evolution of agroecology itself (agroecosystem aspects were considered at an earlier stage than food systems). However, we find this unbalanced and suggest reducing the number of criteria at the agroecosystem levels (examples further in the text) and elaborating new ones, especially at level 4, even though, generally speaking, the criteria in this level look well-established.

For level 4, we suggest that the criterion “Business support for re-establishing the connection between producers and consumers” be divided into more, according to the degree of transformation: it is different to take part in a farmer’s market or an e-commerce scheme, a CSA, or a PGS. In our opinion, these possibilities deserve to be individualized. The geographical denominations might not be a good illustration here, as they mostly function as a marketing strategy for the outside market. In the element Culture and food traditions, a criterion could be created to assess initiatives concerning the promotion of local cultural aspects of food, like festivities, gastronomic festivals, contests, etc.

As for the reduction of criteria, several of them overlap and could be merged to avoid redundancy. This seems particularly relevant since ACT has a specific version for the farming/field scale (F-ACT) and, therefore, the more general project/portfolio scale tool does not benefit from using so many criteria at the agroecosystems level. Criteria should be limited to better represent the characteristics of each level, i.e., *increase efficiency, input substitution, and redesign of the agroecosystem*. For example, in the element

*Regulation and balance*, there is a criterion for “cover crops for pest management” and another for “cover crops for improved soil condition”. Cover crops allow both outcomes, so a simple mention of using cover crops would suffice. Likewise, the inclusion of a criterion “other level 2 systems” seems odd, as the list is so detailed and already includes a very generic criterion of “adopting organic and low-input farming”. The element *Synergies* has a double approach to “landscape planning”, which could be merged into only one. The “climate mitigation” criterion is also somewhat repeated in the elements *Recycling* and *Synergies*, although it might be difficult to isolate such an encompassing criterion. Within the *Diversity* element, there is a criterion “Two-crop rotation” and another “Three+ crop rotation”—could also be merged into one. “Biodiversity” and “natural pollinators” aim to achieve identical goals; thus, they could also be considered redundant. The element of *Resilience* is short on criteria and, in our opinion, reiterates the criterion of “systemic resilience against weather and other disturbances” (one for the present and the other for the future, which seems unnecessary). Resilience comes from diversification, so maybe some criteria related to diversification, particularly linked to the promotion of ecosystem services, could be added to this element. In the element of *Human and social values*, there is a criterion on “Gender and vulnerable groups” (including “youth”). Then, there is another one on “creating decent jobs for rural youth”. They too can be seen as mutually overlapping.

#### 4.3.2 Precision and non-redundancy

Maybe the most controversial is the inclusion of criteria not at the most adequate level. This occurs with the element of *Diversity*, part of level 3. The criterion “diversification of diets and consumption” represents a view of food systems, therefore, aligned with levels 4 and 5; in fact, it is already present in *Culture and food traditions* as “support healthy, diversified and culturally appropriate food...”. To remain in level 3—as it is now—this criterion should be renamed to something like “diversified food production system”. The present situation may have altered the results in our “food system” typology by allowing the element of *Diversity* to look robust due to the positive scores from promoting diversification of diets. Of course, we managed this bias through the application of a minimum threshold, but had the criterion not been there in the first place, the results would have been fine at the initial attempt.

#### 4.3.3 Rationale of score aggregation

When working with clusters of projects, the fact that just one positive criterion is considered enough for element scoring may not be the most adequate. We managed this by creating new charts with the introduction of a minimum threshold. This could also be partially resolved if the abovementioned mismatched criteria are withdrawn from the *incorrect* levels, or at least if the criterion description gets more focused on the levels where they are embedded, as we suggest above. Maybe the threshold could be embedded in the file, and the user could choose (or not) to apply it.

## 5 Conclusion

Achieving agroecological transformation requires reliable validation of initiatives. As key findings from the results obtained, we can pinpoint: (i) Agroecosystem initiatives often fail to integrate higher-level principles; (ii) Holistic initiatives are better balanced

but show some gaps in culture and traditions; (iii) Food system initiatives appear strong in levels 4–5 but weak in agroecosystem levels.

Based on these results, we find that only a limited group of actors in Portugal is already engaged in transitioning to a more just, healthier, and sustainable food system under the agroecological values. We found the assessment tool very effective in evaluating the genuine agroecological transformative character of the analyzed initiatives. This leads us to recommend integrating these assessment tools in policymaking, particularly in the design, conduct, and evaluation of policies and programs. Beyond the Portuguese context, our findings underline the importance of harmonized and transparent assessment frameworks to inform global policy debates on sustainable food systems, particularly in support of the agroecology agenda. At the same time, our critical application of the ACT tool demonstrates the need to refine and adapt such instruments for comparative research, ensuring that future evaluations of agroecology across countries are robust, context-sensitive, and methodologically consistent.

There are limitations in the present study, namely, the lack of further empirical work. This can be addressed in future studies by including participatory fieldwork and interviews with the actors involved in the initiatives, ensuring the scores are fair and well-aligned with the actual efforts and results. The goal of this study was not to characterize the full panorama of agroecology in Portugal but rather to focus on initiatives on research and advocacy (i.e., representing the sociopolitical movements promoting agroecology). While it is more common for studies to apply assessment tools to practitioners (i.e., farm scale), we purposely chose to focus on the socio-political sphere of agroecology. A study covering all dimensions of agroecology would probably need to use different tools due to the specific features of each dimension/scale of analysis. One tool fit for all purposes is something we do not have and probably never will [22, 29]. However, regardless of the tool choice, using an assessment framework is a procedure we fully recommend to avoid co-optation (conscious or unconscious) by corporate power and to ensure the stakeholders involved fully internalize the transformative and systemic benefits of agroecology. Furthermore, an adequate assessment can help guide initiatives into the future and monitor their evolution over time. We expect that the present work will help clarify the state of the agroecological movement in Portugal, contributing to greater awareness among the scientific community, policymakers, and practitioners about the usefulness of using adequate assessment tools to validate agroecological systems. The much-needed transformation of our unsustainable and unfair agri-food system must be done with reliable data, allowing us to adequately monitor, evaluate, and guide future initiatives and policies.

### Supplementary Information

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Supplementary Material 1.

Supplementary Material 2.

### Author contributions

L.D.: Conceptualization, Methodology, Writing—original draft, Writing—review and editing; J.M.R.: Writing—review, Supervision; L.H.: Writing—review, Supervision. All authors read and agreed upon the final version of the manuscript.

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#### Data availability

The datasets generated and analyzed during the current study are available in the OSF repository at <https://osf.io/7ceaz/files/cnbfa>.

#### Declarations

##### Ethics approval and consent to participate

Not applicable.

##### Consent for publication

Not applicable.

##### Competing interests

José Muñoz-Rojas declares he is an Editorial Board Member of Discover Sustainability and confirms that he was not involved in the handling or decision-making of his own submission.

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