

New Insights into Agriculture on Small Mediterranean Islands: A Systematic Review

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Abstract

The numerous inhabited small islands of the Mediterranean basin are marginal geographic territories of high natural value. Historically, island communities have developed complex, poly-cultural agricultural systems, based on the use of native genetic resources and traditional ecological knowledge, to address the challenges linked to unfavorable climate, geology, and topography. However, economic, socio-demographic, and climatic factors have caused farmland abandonment, leading to soil and land degradation and to a decline in biodiversity and ecosystem services. Following the PRISMA guidelines, we conducted a systematic review to assess the state of scientific research with regard to agriculture on small Mediterranean islands. After screening records retrieved on Scopus, Web of Science, CABI, and Google Scholar, 167 articles published before July 2025 were included in the analysis. The articles covered 6 countries and 126 islands, with Greek and Italian islands being the most represented. Key topics included trajectories, drivers, and consequences of land use change, agrobiodiversity, and water resources. To complete the systematic review, 30 relevant EU-funded projects were identified and analyzed. Overall, the scientific research aimed at supporting agriculture on Mediterranean small islands tends to focus on a single issue or very few issues. However, we suggest that given the complexity of the drivers and consequences of farmland abandonment, more integrated approaches could have a greater impact. By providing a systematic overview of the current state of the research on agriculture on small Mediterranean islands, this review offers a solid basis for guiding ongoing and future research, actions, and policies aimed at building resilience in these fragile and endangered lands.



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Keywords: agrobiodiversity; drivers of change; farmland abandonment; landscape; sustainable development; typical agrifood products; traditional ecological knowledge; traditional agroecosystems

1. Introduction

Few places in the world have been as altered by humans as the Mediterranean basin. Anthropogenic disturbances have shaped the highly complex, multi-functional landscape characteristics of the region [1]. Since the end of the Second World War, however, the Mediterranean agricultural systems have been undergoing a deep transformation. Subsistence agriculture was gradually replaced by a more commercial form of agriculture, resulting in the polarization of landscapes, with, on one hand, agriculture extensification and abandonment in rural areas, and on the other, intensification in pockets of more favorable areas [2–5]. Here, intensification is understood as the use of mechanization; the reliance

on agrochemicals for weeds, pests, and diseases control; the intensive use of synthetic fertilizers; the introduction of commercial cultivars; the expansion of irrigated areas; and the specialization of cultivations, in contrast with traditional low-intensity farming systems, with lower yields, but sustaining greater crop variety and higher environmental value. For livestock systems, the intensification process also corresponds to a greater dependence on external feed and increased stocking rates, causing some mountainous areas to be overgrazed, while others have become undergrazed following agricultural abandonment [5]. Even though some differences in the drivers of these changes have been identified [2,5–7], the consequences have globally been similar across the whole Mediterranean region: the homogenization of landscapes [8] and the loss of landscape mosaics of high cultural value [9], accompanied by a decline in biodiversity [10–13], an increase in wildfire risk [14], and, frequently, soil erosion [3].

Among the areas that have been the most marginalized are mountainous areas—and indeed the abandonment of terraced farmland, a typical feature of the Mediterranean region, has been particularly severe [3,6,15]—and small islands. These marginal areas are often insufficiently accounted for in European and national policies, and, for many smallholder farmers, access to the Rural Development Plans of the Common Agricultural Policy is made practically impossible by their lack of legal status as agricultural farms.

The Mediterranean Sea comprises over 10,000 islands [16], mostly small, inhabited islets (Figure 1), but also slightly over 200 populated islands hosting over 11 million inhabitants [17]. Islands are vulnerable territories due to their small economic size, limited resources, access difficulties, and environmental fragility [18]. Moreover, many Mediterranean small islands suffer from the double insularity phenomenon, a term characterizing the situation of small satellite islands acting as satellites of larger islands on which they heavily depend [19,20], such as the circum-Sicilian and circum-Sardinian islands in Italy, the island of Gozo in Malta, and many Greek islands (e.g., Symi, an island near the large island of Rhodes). Double insularity implies a greater vulnerability because goods and passengers must be first transported to the larger island, adding additional costs, and the administrative dependence of larger islands often means that subsidies do not reach these small territories [19,20]. In addition, mass tourism, tied up with waste generation, water and energy consumption, and urbanization, puts the fragile ecosystems of small islands even more at risk.

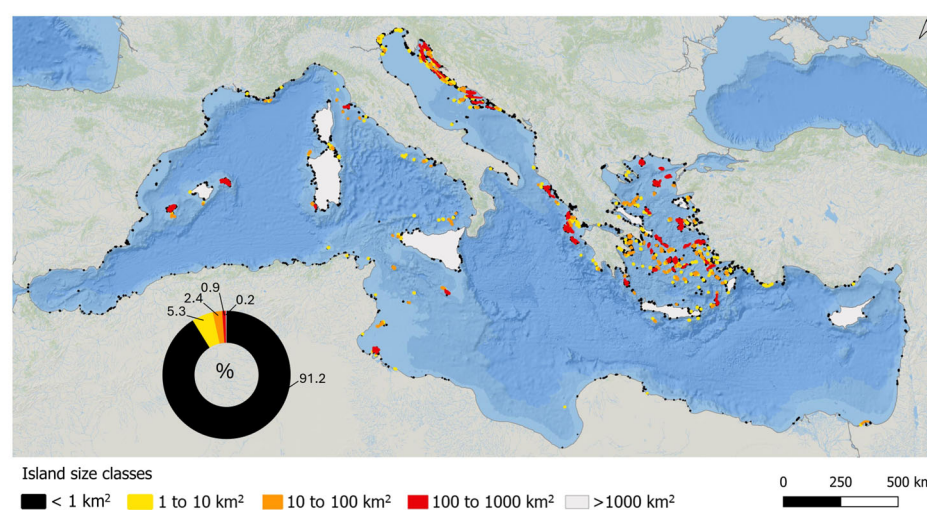


Figure 1. Islands of the Mediterranean Sea. The pie chart indicates the proportions (%) of islands of each size class. The figure was generated based on data from Sayre et al. [21], modified to include only islands in the Mediterranean Sea.

The preservation of traditional agricultural practices is recognized as essential for the conservation of biodiversity, the economic development of rural areas, population well-being, and wildfire prevention [4,9,12,13]. Yet, traditional agroecosystems on small islands are endangered. This systematic review aims to examine the current body of knowledge on agriculture on small Mediterranean islands with the view of identifying how researchers could further contribute to the maintenance and revitalization of these ecologically and socially valuable landscapes. More precisely, it aims to answer the following questions:

Q1. *How is academic research related to agriculture on small Mediterranean islands distributed temporally, spatially, and in terms of involved researchers?*

Q2. *Which aspects of agriculture on small islands have received the most attention from the researchers' community, and have some been neglected?*

Q3. *How does academic research effectively address the issues linked to agriculture on small islands, and how could it be more impactful?*

2. Methodology

The first step was to clarify what would be included in the designation “small island” in this literature investigation. Indeed, the common definition of “small islands” as territories with a maximum area of 10,000 km² and a population not exceeding 500,000 inhabitants [22] is often judged inadequate in the Mediterranean context, where narrower definitions are commonly adopted [23–25]. Based on the dynamics, process, and challenges described in the literature for agriculture on Mediterranean islands, a rather large definition was adopted, and this review considers islands smaller than 1000 km², regardless of their population, as long as they are inhabited. This definition includes about 200 islands.

This study is primarily based on a systematic review of the literature, conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines from 2020. However, to better answer the research questions, especially Q2 and Q3, a systematic search of European Union-funded academic research projects was also conducted.

2.1. Systematic Literature Review

The literature search was conducted by collecting articles from scientific literature databases, screening the results, and selecting relevant articles, as depicted in Figure 2.

2.1.1. Article Collection and Screening

The initial pool of publications was retrieved from four databases from March to June 2025: Scopus, Web of Science, CABI, and Google Scholar. Due to the extremely high number of hits when using Google Scholar, the results were sorted by relevance and limited to the first 500 entries, after observing that, beyond this number, the results did not contain any relevant articles.

The search terms were combinations of location-related keywords and agriculture-related keywords, chosen to ensure the topic was thoroughly covered. Location-related keywords were “Mediterranean” and “island” or “islands”. The agriculture-related keywords were “agriculture”, “farming”, “farmers”, “agricultural”, “cultivations”, “farms”, or “crops”. The search was applied to the title, abstract, and text. The analysis was restricted to agricultural activities on terrestrial land.

Duplicate articles were removed. Articles were then screened in a sequential process by reviewing titles, language, publication types, and abstracts, excluding non-relevant records at each step according to the defined criteria. Finally, the full texts of the remaining articles were assessed for relevance (Figure 2). The screening was performed by a single

reviewer, which ensured consistency throughout the process and minimized the risk of selection bias.

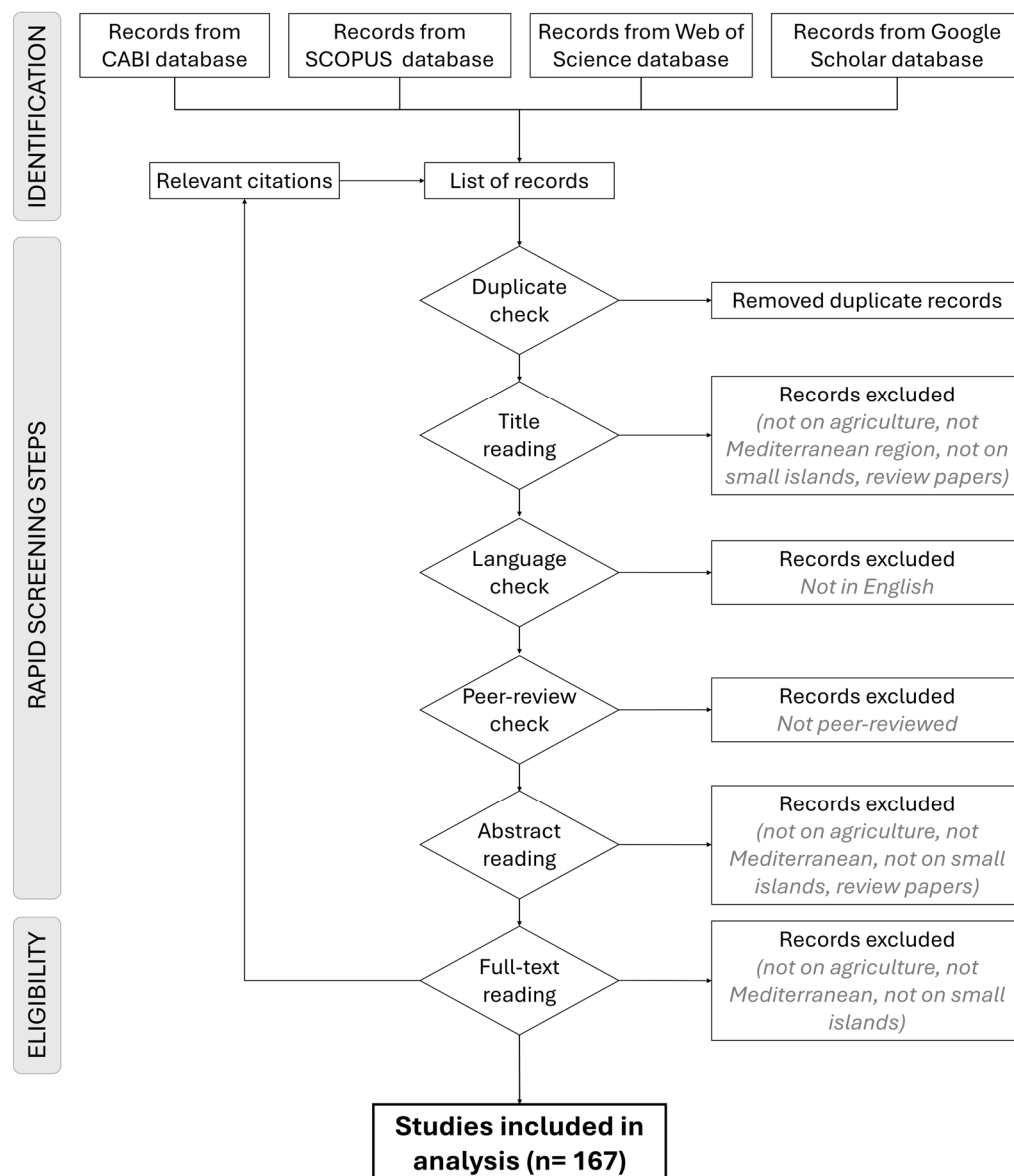


Figure 2. Flowchart describing the literature search process for the systematic review.

Inclusion and exclusion criteria were defined to warrant the relevance and reliability of the selected articles (Table 1). First, this review focused exclusively on papers related to Mediterranean islands smaller than 1000 km²; thus, studies from outside the Mediterranean region and/or on larger islands were excluded. Studies on uninhabited islands were also considered irrelevant. Moreover, studies had to be related to agriculture to be included, even if not necessarily focusing strictly on this topic. For instance, botanical studies reporting the effect of agriculture intensification or abandonment on wild flora were considered relevant to answer the research questions.

Literature reviews and perspectives were excluded, and only research articles and articles reporting on relevant initiatives were considered. In addition, articles in any language other than English were excluded. MSc and PhD dissertations and governmental or institutional reports were excluded, as well as book chapters and conference articles (unless it was clearly stated that they had been peer-reviewed).

When reviewing the full texts, references that appeared relevant and were not included in the pool of articles obtained from the database search were submitted to the same screening process.

Table 1. Inclusion and exclusion criteria used to screen for relevant articles.

Criteria	Inclusion Criteria	Exclusion Criteria
Language	English	Any other language
Location	Islands in the Mediterranean Sea, no larger than 1000 km ² , inhabited	Not on islands, other islands (not in the Mediterranean Sea and/or larger), uninhabited islands
Peer-review	Peer-reviewed journal publications, book chapters, and conference proceedings if peer-reviewed	Reports, dissertations Book chapters, and conference publications, unless clearly stated that they were peer-reviewed
Type	Research articles	Review articles, Perspectives
Research focus	Articles related to agriculture	Articles not related to agriculture, including articles on water resources or plant diversity with no connections made to agriculture

2.1.2. Data Extraction, Analysis, and Visualization

Articles selected for analysis were exported to a reference management software (Mendeley Desktop 1.19.8), making sure that keywords and abstracts were included for each article and that the respective authors' names were consistently written across all references. The reference list was downloaded as a RIS file and used to compute co-occurrence networks of authors and of words from abstracts and titles with a software for visualizing and analyzing academic literature networks (VOSviewer version 1.6.20).

Key information, such as journal, publication year, country, and authors' keywords, was collected from each article and organized in a spreadsheet (Microsoft Excel). The following additional data were extracted by carefully reading the articles, added to the spreadsheet, and color-coded: (i) the island(s) studied, (ii) the agrosystem, livestock, or crop(s) studied, (iii) the main research themes, and (iv) the type of contribution provided by the study. Again, the data extraction was entirely conducted by one reviewer. To guarantee the reliability of the results, the research themes and contribution types assigned to each article were double-checked by the same reviewer once all articles had been categorized.

The compiled data was completed with the surface of each studied island, taken from the MEDIS database [26]. Uninhabited islands were excluded from the islands' analysis. Furthermore, populated islands absent from the selected articles were identified. This search was performed systematically for islands larger than 1 km². However, due to the very large number of smaller islands combined with the fact that extremely few of them are populated, islands below 1 km² were only checked if the MEDIS database indicated the presence of road infrastructure.

Authors' keywords were homogenized so that all keywords with similar meaning would be represented by the same term. For instance, "agrobiodiversity", "agricultural diversity", and "crop diversity" were all represented by "agrobiodiversity". Keywords referring to countries or islands were removed. A word cloud of keywords was generated using an online word cloud generator (<https://www.wordclouds.com/>, accessed on 9 September 2025).

Data analysis and graphical representation were performed with Excel and the statistical software R version 4.5.0. The open-source software QGIS (version 3.44.0) was used for the islands' size distribution analysis and to represent the spatial distribution of islands reported in the bibliography.

2.2. Academic Project Review

2.2.1. Project Search and Screening

In order to review academic research projects related to agriculture in small Mediterranean islands, four project databases were searched:

- The Cordis database (cordis.europa.eu), which lists projects funded under the successive Framework Programs (FP1-7), Horizon 2020, and Horizon Europe;
- The Life database webgate.ec.europa.eu/life (accessed on 17 August 2025);
- The Interreg Europe database (www.interregeurope.eu, accessed on 9 September 2025);
- The Mediterranean Sea Basin Program database (www.enicbcmmed.eu, accessed on 9 September 2025), listing projects funded by the Cross-Border Cooperation initiative implemented by the European Union under the European Neighborhood Instrument.

The keywords “Mediterranean”, “islands”, and “agriculture”, or “farmers” were combined for the search. Projects were screened based on their research focus and implementation area.

The project list was completed by adding any relevant projects indicated in the funding information of the selected bibliography. Since national projects could not be reviewed for all Mediterranean countries due to language barriers, only EU-funded projects were searched.

2.2.2. Data Extraction and Analysis

Once the list of eligible projects was compiled, the projects’ names, active period, and funding program were recorded using a spreadsheet (Microsoft Excel). Additionally, the project description, publications, and results were reviewed to extract: (i) the small islands involved in the project and the corresponding countries, (ii) the issues addressed by the project, and (iii) the proposed solutions. Color coding for the issues and solutions was used to facilitate analysis. The data was then processed and represented using Excel and R.

3. Results

The final selection comprised 167 articles sourced from 105 different journals (the list of selected publications is provided in the Supplementary Materials, Table S1). The three most frequent journals are *Genetic Resources and Crop Evolution* (5.4% of publications), *Plant Genetic Resources Newsletters* (5.4%), and *Sustainability* (4.2%).

3.1. Bibliometric Analysis

3.1.1. Temporal and Country Distribution

Greece, the country with the most Mediterranean-inhabited islands (Figure 3a), has attracted the most research on small island agriculture, with 44% of the selected articles (74 publications) focusing on Greek islands (Figure 3b). Italy comes next (51 publications), despite having much less inhabited islands, followed by Malta (18 publications), the only Mediterranean island state with inhabited small islands. For Croatia, the second Mediterranean country in terms of inhabited small islands, only 14 publications were found. A few studies focus on Spain (seven publications) and Turkey (three publications), both of which count very few inhabited small islands.

Three countries with inhabited small islands were absent from the article selection: Montenegro, France, and Tunisia. Montenegro only has one very small inhabited island (0.35 km²) with a few inhabitants. The eight inhabited French islands are rather small (the largest, Porquerolles, is just 13 km²) and their total population is less than 400. On the contrary, of the three inhabited Tunisian islands, the largest, Djerba (512.4 km²), has around 180,000 inhabitants, while the two others, Chergui (93.4 km²) and Gharbi (49.1 km²), are part of the Kerkennah archipelago and together are home to about 15,000 inhabitants.

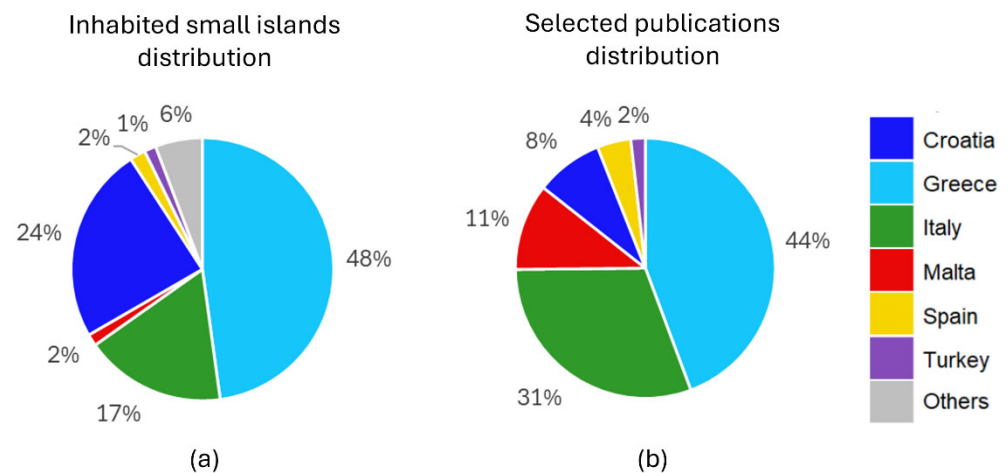


Figure 3. (a) Distribution of the inhabited islands (<1000 km²) of the Mediterranean Basin. (b) Distribution of the selected articles by country.

Looking at the temporal distribution of studies, articles related to agriculture on small Mediterranean islands were relatively few until 2007, when numbers started to increase more rapidly (Figure 4a). Initially, studies focused mainly on Italy (Figure 4b). From 2010, Greece became the most studied country. Studies in Croatia and Malta became more common from around the early and late 2010s, respectively, while studies in Spain and Turkey were mainly published in the last few years.

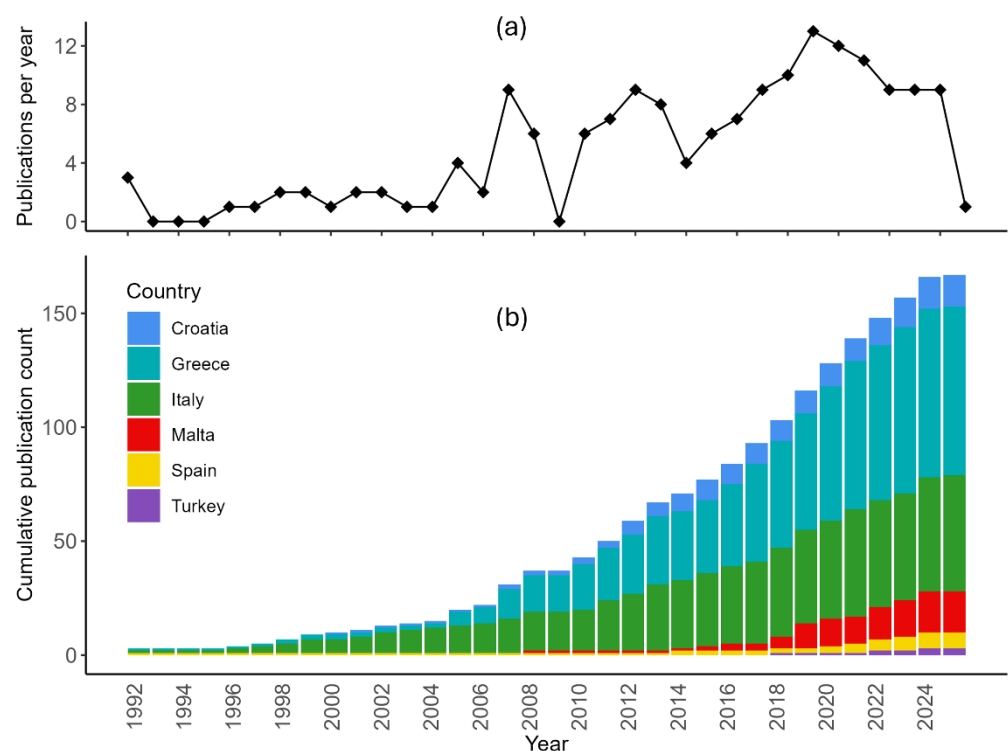


Figure 4. (a) Distribution of the selected articles by year. Note that the final database check was performed in April 2025, hence the low number of articles for that year. (b) Cumulative distribution of the selected articles throughout the year, classified by countries.

3.1.2. Study Case Distribution

At the country level, studies are not homogeneously distributed between islands (Figure 5). To understand why some islands are well studied while others are neglected,

the geographical position, size, and population of both studied and not studied inhabited islands were examined.

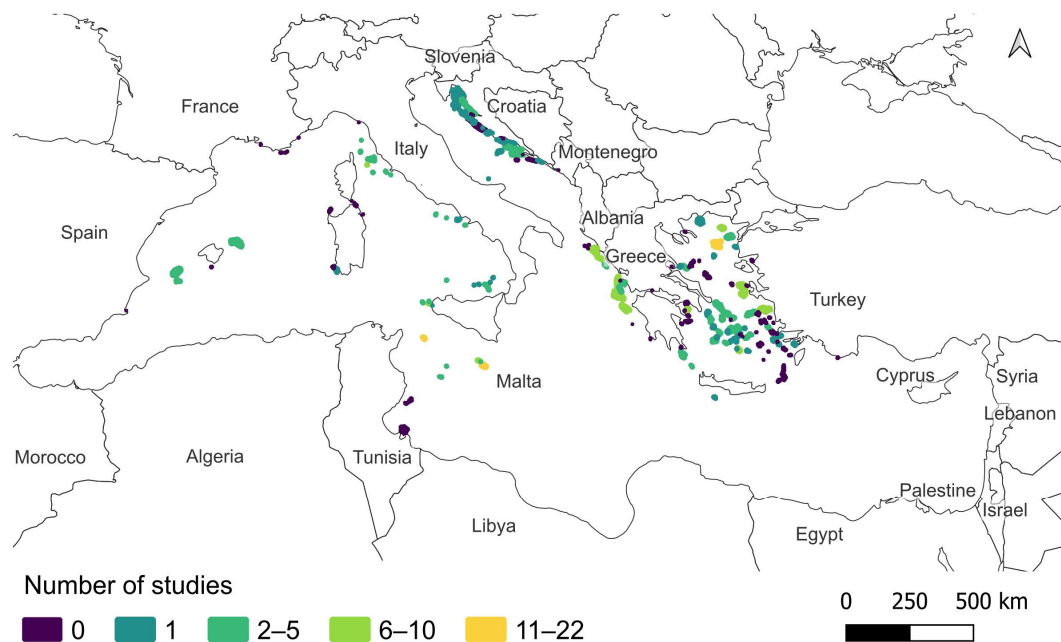


Figure 5. Number of studies on the inhabited small islands of the Mediterranean basin. For visibility, islands are represented larger than the scale.

For Greece, just over half of the inhabited islands have been studied ($n = 51$). Most studies concern islands in the Ionian and North Aegean archipelagos, with most of these islands appearing in multiple studies. The Cyclades islands are also well covered, although only Santorini has been extensively studied ($n = 9$). On the contrary, very few studies were found about the Saronic, Northern Sporades, and Dodecanese islands, with the exception of the Saronic island Aegina ($n = 7$). These archipelagos include some relatively large and well-populated islands. For example, in the Dodecanese archipelago, Karpathos is 302.5 km² and has over 6000 inhabitants, while the smaller Kalymnos (112 km²) has a population of nearly 18,000 inhabitants. Skyros, a Northern Sporades island, is 210.3 km² and has about 3000 inhabitants. In the Saronic Gulf, Salamina (97.7 km²) has nearly 40,000 residents.

However, in general, the proportion of Greek inhabited islands not having been the subject of agricultural research increases with diminishing island area (Figure 6). Most islands smaller than 50 km² have not been studied. Twenty of them have less than 100 inhabitants, among which eleven have fewer than 10 permanent residents. Yet, the other neglected islands have several hundred to several thousand inhabitants. Furthermore, among the 15 islands present in more than four studies, only Meganisi (20 km²) is smaller than 76 km² (Appendix A, Figure A1). Islands smaller than 50 km² represent 61% of the Greek inhabited small islands, but only 21% of the islands mentioned in studies when including repetitions, whereas islands over 250 km², which represent barely 14% of the inhabited islands, represent 43% of the islands mentioned (Appendix A, Figure A2).

In Croatia, mostly the central and northern islands have been studied. All islands absent from the selected bibliography are between 18 and 117 km², except for the very small island of Vrnik (0.31 km²), and most of them host several thousand inhabitants. Although smaller islands seem to have been well covered (Figure 6, Appendix A, Figure A2), it should be noted that, except for one study on Jalkan (3.2 km²), all islands smaller than 50 km² that have been studied appear in the same article, which sought to describe drivers of land abandonment [25]. Putting aside this article, there would be a strong bias toward larger islands, especially toward islands over 250 km². Three of the four islands that have

been studied multiple times are larger than 250 km². Hence, larger Croatian islands are overrepresented in studies, with respect to their proportion (Appendix A, Figure A2).

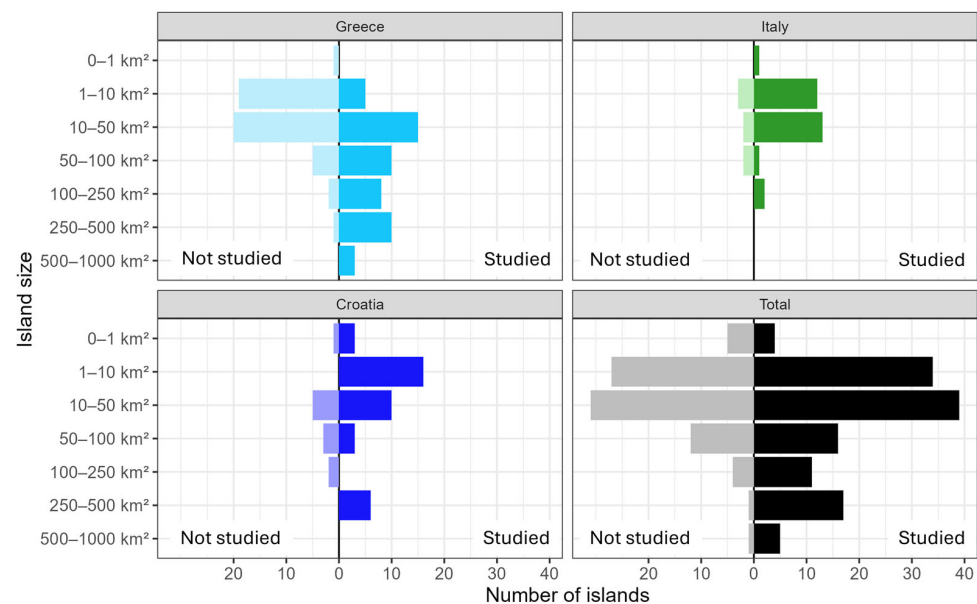


Figure 6. Number of inhabited islands for which relevant articles were found (**right**) or not found (**left**), per size classes, for the three countries with the most islands (Greece, Italy, Croatia), and for the whole Mediterranean basin (Total).

In Italy, 80% of the inhabited small islands are included in the selected articles. Every island around Sicily or along the mainland coast has been studied, apart from Palmaria. On the contrary, a single circum-Sardinian island is represented in the bibliography. Among the seven missing islands, three are nearly uninhabited (Santa Maria, Asinara, and Tavolara), and two have fewer than 100 inhabitants: Caprera (16 km²) and Palmaria (1.7 km²). However, San Pietro (51.5 km², over 6000 inhabitants) and La Maddalena (20.9 km², over 10,000 inhabitants) were also absent from the bibliography.

Globally, the proportion of studied and inhabited Italian islands by size classes is rather similar, with a great majority of islands below 50 km² (Appendix A, Figure A2). However, when considering how many times each island was studied, islands 50–100 km² gain in importance at the expense of very small islands, mainly because Pantelleria (83.4 km²) is by far the most studied island (19 articles) (Appendix A, Figure A1), whereas most islands studied only once are below 10 km².

All three Maltese inhabited islands were studied, with both size and population explaining their respective number of studies (Appendix A, Figure A1). There are studies on the three major Spanish small islands in the Mediterranean Sea (Menorca, Ibiza, and Formentera), and only two smaller, barely populated islands have not been studied. Only the two largest of the three inhabited Turkish Mediterranean islands identified are represented in the selected articles.

Looking at all Mediterranean small islands reveals that larger islands have more chances to have been studied, especially those larger than 250 km² (Figure 6), and are more likely to appear in multiple studies (Appendix A, Figure A2). Only about 56% of the inhabited islands between 1 and 100 km² have been studied. This proportion falls to 44% for even smaller islands.

3.1.3. Author Network

A total of 561 authors have contributed to the selected articles. Using a threshold of two publications and removing authors with a total strength link of 0 (i.e., not connected to

any other authors meeting the threshold), a co-authorship network was created, consisting of 75 authors grouped in 13 distinct clusters (Figure 7).

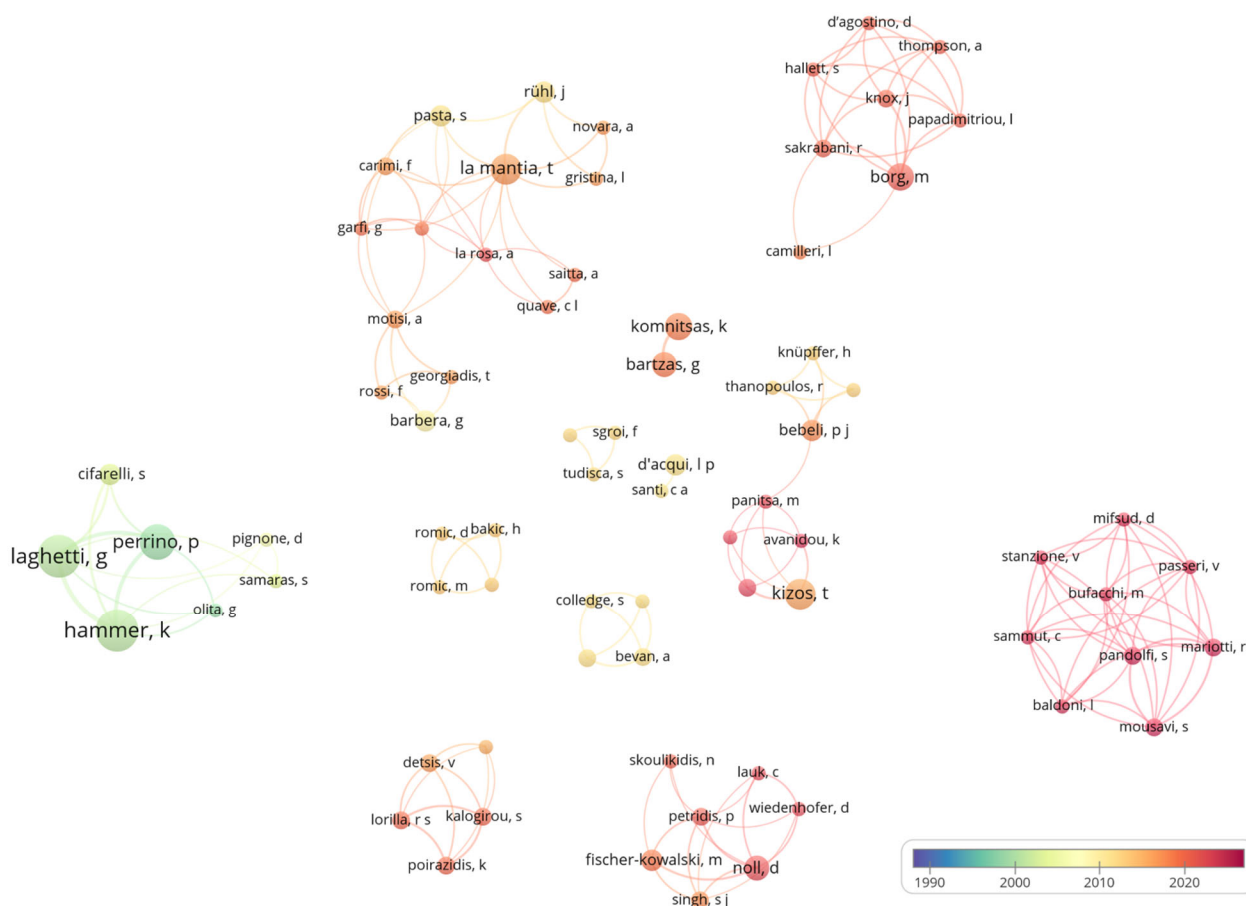


Figure 7. Visualization of the co-authorship network for authors involved in at least two publications among the selected bibliography.

Most clusters represent almost exclusively a single country (sometimes a single island) and one research topic. Clusters typically consist of small nodes almost all connected to each other, indicating a small number of articles. Furthermore, almost all clusters represent a short time frame. For instance, one small cluster corresponds to authors studying the consequences of terrace abandonment on Antikythera (Greece) [27–29].

There are two exceptions. One centers around a group of authors who carried out studies on Italian islands. The other gathers authors interested in Greek islands. These two clusters cover a wider range of topics, a more extended time frame, and a greater diversity of islands, even though there is a clear focus on Lemnos (Greece) and Pantelleria (Italy).

3.2. Research Focus

The word cloud of keywords highlights the tight connection between agriculture and landscape on Mediterranean small islands (Figure 8). The word cloud also underscores the magnitude of the phenomenon of farmland abandonment and the efforts toward sustainable development. The prominence of “agrobiodiversity” and related terms (“landraces”, “crop collecting”, “wild relatives”, “germplasm”, “genetic erosion”, etc.) emphasizes the value and richness of crops and wild relatives’ diversity and the need for their conservation. The significant presence of terms related to water indicates that water resources are a major concern. Finally, the word cloud hints at the importance of olive and grapevine cultivation.

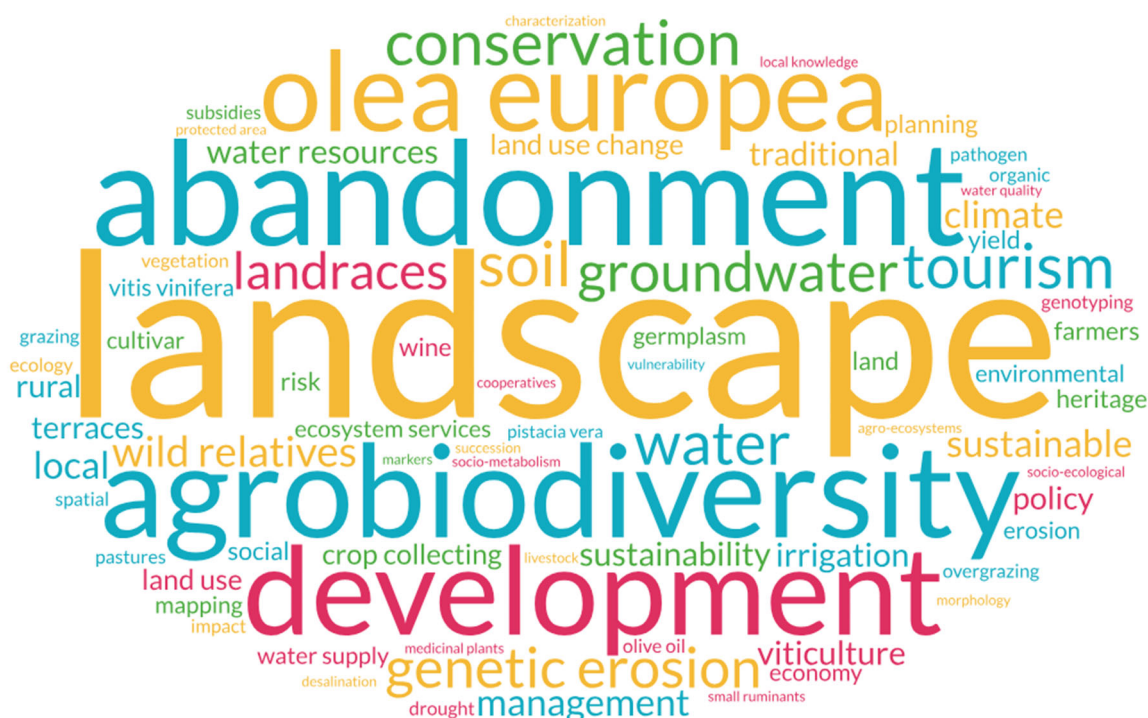


Figure 8. Word cloud of the 75 most frequent keywords in the selected bibliography.

3.2.1. Agroecosystems

The number of studies focusing specifically on one or a few agricultural systems is limited. Yet, the importance of vineyards and olive groves for the agriculture of small Mediterranean islands is evident (Figure 9). The next most common crop is pistachio trees, although these studies have been carried out solely on Aegina island (Greece). Only a few studies are dedicated to other crops. Most studies on vegetables and tubers come from the Maltese islands. In fact, just two studies on tomatoes and one on eggplants do not concern Malta, and all three focus on the characterization of local landraces [30–32]. Among livestock systems, small ruminants, in particular sheep, are also well studied.

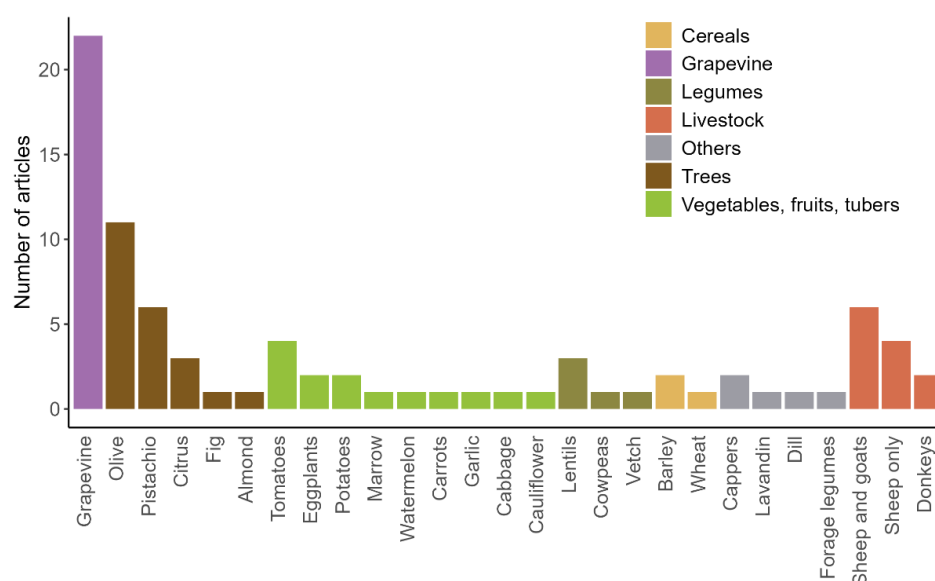


Figure 9. Number of studies focusing on specific crops or livestock, classified by categories.

This reflects general trends for agriculture on small Mediterranean islands. Indeed, vineyards and olive groves have suffered less abandonment than cereals, pulses, and veg-

etale cultivation as they are less labor-intensive, more compatible with other employment activities (e.g., in the tourism sector), and more economically viable cultivations [25,33–35]. Additionally, on many islands, extensive husbandry is now taking place on previously cultivated land [36–40].

3.2.2. Key Research Themes

The network of words appearing in the title and/or abstract of more than five articles reveals four distinct clusters (Figure 10). The extent of the green cluster shows the importance of agrobiodiversity for agriculture on small Mediterranean islands. The red cluster focuses on the processes and consequences of change. The blue cluster is centered around resource limitations (in particular, water) and other threats to agriculture (e.g., climate change). Finally, the yellow cluster concerns opportunities for development.

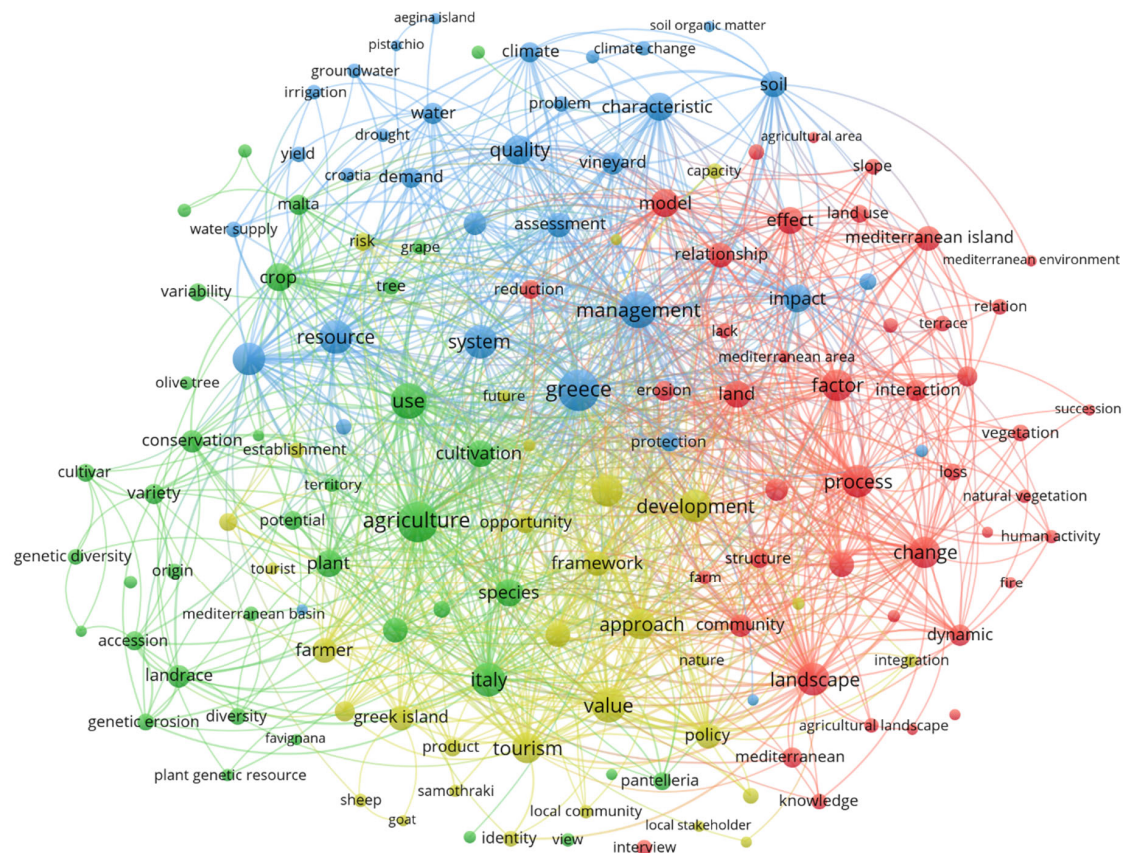


Figure 10. Co-occurrence network of words from titles and abstracts of the selected articles. Colors represent different clusters of frequently co-occurring words.

To further identify the key research themes and inspect them at the country level, each article was assigned up to three topics. It should be noted that since topics are tightly interconnected, there is some overlap between them. The heatmap generated to visualize the topic density by country shows the most common research themes and how research topics follow a different pattern for each country (Figure 11).

Agrobiodiversity is by far the most researched topic (41 publications). Other major themes are the environmental impact of change ($n = 28$), the continuation or revival of agriculture ($n = 24$), and water resources ($n = 23$). Many studies also regard trajectories of changes in agriculture ($n = 19$), drivers of change ($n = 18$), and local knowledge ($n = 17$). Other key components of agriculture, such as plant health, ecosystem services, or the farmers themselves, have received less attention so far.

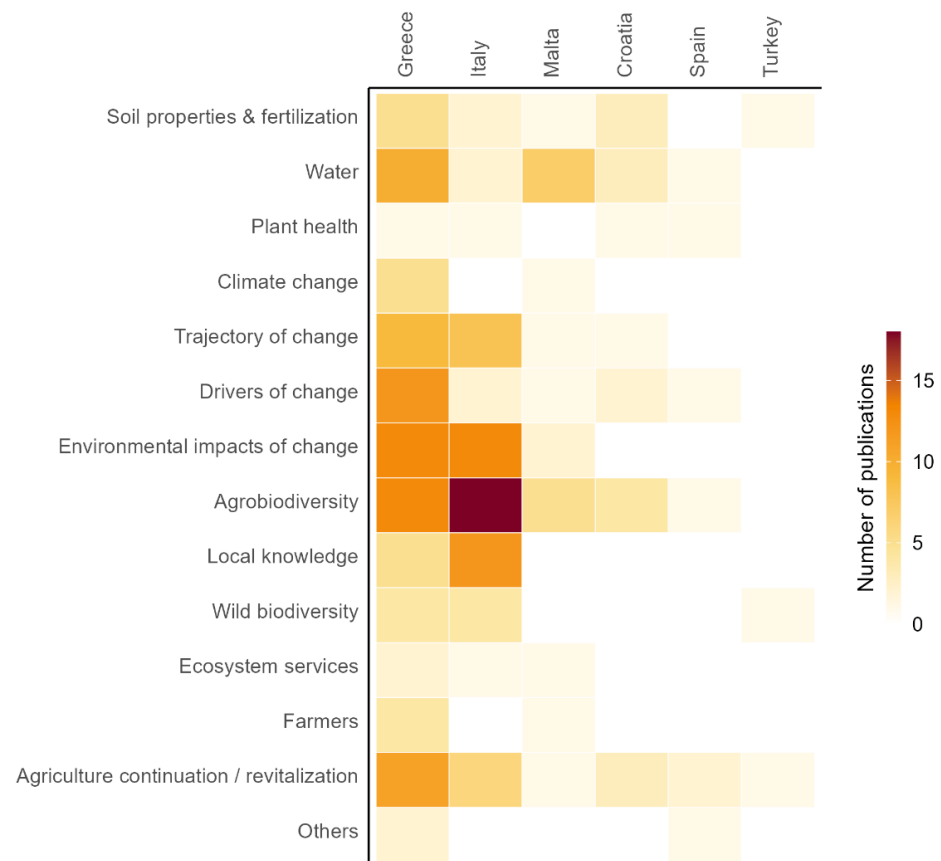


Figure 11. Topic popularity by country. A maximum of three topics was assigned to each article of the selected bibliography ($n = 167$).

In Greece, the most prominent topics are genetic resources, environmental impacts of change, past and current drivers of change (and indeed for no other country have those been covered to such an extent), and agriculture revitalization. Other important topics are the trajectory of change, water, and farming practices, but most topics have been relatively well investigated.

In Italy, the focus is more on the consequences of farmland abandonment than on causes, further threats, or even potential way forward. Indeed, many studies have been interested in the loss of genetic resources, the environmental impacts of abandonment (positive or negative), the loss of local knowledge, and the disappearance of traditional farming practices.

Despite fewer publications, a range of topics have been somewhat covered in Malta. However, water is clearly a priority. Genetic resources, or more precisely, local olive tree varieties, are also an important topic. In Croatia, the focus is mostly on drivers of change and limitations to agriculture (soil, water, plant health), but there are also a few studies on the development of agriculture and islands' communities, as well as on genetic resources. Spain follows more or less the same pattern.

3.2.3. Trajectories of Change

Between the end of World War II and now, agriculture on small Mediterranean islands has followed three main trajectories: abandonment, shift from cultivation to husbandry, and, in rare cases, intensification. A total of 19 articles focus on these transformation trends, either by thoroughly describing the changes that occurred, or by quantifying them in terms of agricultural area, farmers' population, or livestock number evolution.

For Malta and Croatia, only one article describes changes, a decline in both cases [25,41], although Faričić et al. [25] quantified agriculture waning on many Croatian islands. It should be noted that even intensification occurred in Malta [41] and in some limited locations on Croatian islands [42], even though these changes have not been quantified. In Italy, farmland abandonment has been described in seven articles referring to various islands [33,43–48] and has been mentioned in many more publications, with no report of intensification found. In addition, one study on the island of Sant’Antioco showed how surfaces dedicated to various crops have changed within a few years [49].

In Greece, agriculture has evolved in more varied ways: decline is described in seven articles [39,40,50–54], but the replacement of crop cultivation by husbandry is widespread, as detailed in five publications [37,39,40,50,52]. Furthermore, intensification sometimes occurs on the plains, even as abandonment takes place in hilly areas [55].

3.2.4. Drivers and Threats to Agriculture

Although agricultural systems were left unchanged in almost no Mediterranean islands, the factors driving their transformation have been thoroughly investigated only in Greece ($n = 12$). For Croatia and Italy, two articles were found, while Spain had just one study. Following the trajectories of change reported in each country, studies in Croatia, Italy, and Spain concentrate on drivers and threats leading to cropland abandonment [25,33,46,56,57]. On the other hand, studies in Greece discuss what brought the shift from crop cultivation to livestock farming ($n = 6$) [37,39,40,50,52,55], farmland abandonment ($n = 5$) [53,58–61], and cultivation intensification ($n = 2$) [58,62], with some articles explaining various trends.

Changes to agriculture were primarily due to demographic factors, tourism, and economic factors (Table 2). According to the literature, drivers of change are complex, interconnected, and might have different outcomes depending on the context. For instance, tourism often increases land prices and offers better employment opportunities, leading to farmland abandonment, but by creating new markets and raising the demand for specific products, tourism has, in a few cases, led to local intensification of agriculture (e.g., viticulture on Santorini [58]). Similarly, depopulation and farmers’ aging usually lead to abandonment (e.g., [25,33]), but has also been associated with the expansion of husbandry as more land becomes available at a cheap price [55].

Table 2. Drivers of change in agricultural land use.

Drivers	Number of Studies (% ¹)	Mechanisms	Outcomes
Demographic	9 (50%)	Depopulation, rural exodus, aging	Abandonment, husbandry
Tourism	9 (50%)	Alternative employment Urbanization New market	Abandonment, husbandry Abandonment Intensification
Economic	8 (44%)	Production costs, transport costs, cheaper imports High product price, Common Agricultural Policy subsidies Production costs, new markets	Abandonment, husbandry Husbandry Intensification
Social	3 (17%)	New lifestyles, new technologies Quality wine trends	Abandonment, husbandry Intensification
Lack of infrastructure	2 (11%)	Lack of rural roads	Abandonment
Others	6 (33%)	Diseases, wildlife damage, small surfaces, uncontrolled grazing, earthquakes Fossil fuels (lower labor input), good pasture availability, mechanization difficulty	Abandonment Husbandry

¹ considering the studies on drivers ($n = 18$).

Besides the most common forces, a variety of drivers have been identified on different islands, such as consumers’ attitude and preferences, small farms, lack of good road

infrastructures, natural disasters, fossil fuels, the availability of good pastures, the fact that fields not accessible with machinery were better suited for livestock, or damages to crops (or fields) by diseases, wild animals, or uncontrolled livestock [37,39,40,56,60,61].

3.2.5. Water Resources on Small Islands

Studies related to water were divided into five categories (Table 3), with some studies covering two categories. Water scarcity is a major problem in the Mediterranean basin, worsening with climate change. Hence, various authors have sought to estimate water resources on islands [63–70], while others have focused on agricultural water demand [63,66,71–75].

Table 3. The different research questions within the “water resources” theme.

Category	Subjects Included	Number of Studies (% ¹)
Water availability	Groundwater resources estimation, evolution of rainfall and droughts	9 (39%)
Agriculture water requirements	Evapotranspiration, water use efficiency, crop water requirements, irrigation strategies	7 (30%)
Groundwater quality	Salinity, nitrates, heavy metals	7 (30%)
Alternative water supply	Desalination, rainwater harvesting	7 (30%)
Water issue identification and solution	Identification of any kind of water-related issues and discussion on potential solutions	2 (9%)

¹ considering studies on water ($n = 23$).

Groundwater quality is also a concern [65,68,69,76–79], especially due to seawater intrusion into aquifers, a phenomenon exacerbated by low water availability [64,65]. In Chios (Greece), salinization of the aquifer can even lead to mercury release into groundwater [77]. Furthermore, agriculture itself can be a source of groundwater contamination.

The fourth category regards alternative water supply options [64,67,71,80–83], such as desalination or rainwater harvesting. Lastly, a couple of articles aim to identify any kind of water-related issues (scarcity, pollution, lack of skills, lack of information, water losses, lack of regulation, etc.) and discuss potential solutions [79,84].

Research topics differ depending on the country. In Greece, there is a focus on groundwater pollution and water availability, especially in relation to climate change. Indeed, several authors have investigated past and future evolution of precipitation and drought frequency, and their impacts on water resources and water demand [67,68,81,85,86]. In contrast, most studies in Malta tend to focus more directly on agricultural water requirements [72–75]. Croatian studies looked at current water resources and alternative sources [63,64,80]. The two studies in Italy (both on Favignana) are interested in groundwater availability and quality [65,76], and the only study in Spain concerns alternative water supply [82].

3.2.6. Environmental Impacts of Change

The decline of agriculture, the transition to extensive livestock grazing, and the intensification of agriculture each affect the environment. The agricultural changes and the parameters investigated are summarized in Table 4. The majority of information related to this comes from studies in Greece and Italy (13 articles each). The two other studies on the topic were conducted in Malta. While in Italy and Malta, studies concern exclusively the impact of farmland abandonment, in Greece, studies are shared between the three trends (abandonment, husbandry, intensification), following the respective trajectories of change described in these countries (see Section 3.2.3).

Table 4. Environmental impacts studied for various trends in agriculture.

Change	Impact Studied	Number of Studies (% ¹)
Abandonment	Vegetation succession	6 (21%)
	Carbon efflux and storage	5 (18%)
	Soil erosion	4 (14%)
	Plant diversity	2 (7%)
	Invasive species	1 (4%)
	Soil properties (not SOC)	1 (4%)
	Animal habitats	1 (4%)
Husbandry	Vegetation succession	2 (7%)
	Soil erosion	2 (7%)
Intensification	Water pollution	4 (14%)
	Greenhouse gas emissions	3 (11%)
	Soil properties	1 (4%)

¹ considering studies on impacts of change ($n = 28$).

Agriculture abandonment can have both positive and negative impacts. On the one hand, in the absence of grazing or fire pressures, natural vegetation recolonizes abandoned fields [28,29,44,51,87,88]. This is accompanied by an increase in soil organic carbon and carbon storage in biomass [89–93]. On the other hand, plant diversity is reduced, endangering some native species [34,94], invasive species can establish more easily [95], habitats are lost, putting animal species at risk [96], and erosion often increases [27,41,97,98].

Heavy grazing affects vegetation succession, leading to the dominance of unpalatable species and a reduction in plant cover, and increases soil erosion, ultimately resulting in land degradation [36,38,99,100].

Publications on effects of intensification all come from a work on pistachio cultivation in Aegina island (Greece) and report effects on water pollution, greenhouse gas emissions, and soil properties [78,101–104].

3.2.7. Agrobiodiversity

Of the 41 publications on genetic resources, nearly half come from studies carried out in Italy ($n = 18$). The others are divided between Greece ($n = 13$), Malta ($n = 5$), Croatia ($n = 4$), and Spain ($n = 1$). Studies within this research theme could be grouped into seven topics (Table 5).

The largest group comprises articles describing the general diversity of cultivated crops and wild relatives on a given island ($n = 16$) [47,48,105–116]. The only such study outside Italy or Greece is one list of wild crop relatives on the Maltese islands [106].

A second major topic is intra-species variability, either between different landraces or varieties on one island [32,34,56,117–123], between landraces of different provenance [30,124–126], or even within one single landrace [32,127]. These studies generally looked at genetic variability based on molecular analyses, but sometimes also checked morphological traits, productivity, and/or quality. Additionally, vine cultivar diversity on several Italian islands [34,120] and on the Croatian island of Hvar [56] were documented thanks to information from local farmers.

Although many studies mention that genetic resources are disappearing or endangered, just six articles discussed genetic erosion in more depth [35,109,111,112,128,129]. Here it should be noted that genetic erosion is not only due to the decline of cultivation, but also to changes in farmers' crop selection to accommodate for off-farm activities, consumer preferences, and the introduction of commercial varieties [47,129].

Table 5. Specific research topics within the “genetic resources” theme.

Topic	Sub-Topic	Number of Studies (% ¹)
Diversity of crops and wild relatives	Total	16 (39%)
	Wild and cultivated plants	12 (29%)
	Cultivated plants	1 (2.4%)
	Wild plants	3 (5%)
Intra-species variability on a single island	Total	10 (17%)
	Identified on molecular basis	5 (12%)
	Identified through farmers’ interviews	3 (7%)
	Performance/quality comparison	3 (7%)
Variability within one landrace	-	2 (5%)
Variability among landraces of different provenance	Total	4 (10%)
	Molecular	2 (5%)
	Morphological, phenotypical, phenological	3 (7%)
Genetic resources erosion	-	6 (15%)
Variability among oils from different olive tree genotypes	-	4 (10%)
Livestock genetic diversity	Total	4 (10%)
	Sheep	3 (7%)
	Donkey	1 (2.4%)
Others	-	2 (5%)

¹ considering the studies on genetic resources ($n = 41$).

Four studies characterized the olive oil obtained from different olive tree genotypes [121,130–132]. A few studies concern livestock genetic resources: three on sheep [133–135] and one on donkeys [136]. These studies provide information on genetic variability, inbreeding, or selection signature, for population preservation and future selection purposes.

Lastly, one publication checked the stability of a tomato landrace during in situ and ex situ selection programs [31] and another checked the quality of one local barley and two local vetch landraces [137].

Of note, the vast majority of studies explore the general agrobiodiversity on islands and do not focus on one crop. Studies regarding a single crop mainly look at olive trees (*Olea europaea*) and olive oil ($n = 7$), especially in Malta, where four out of five studies on genetic resources focus on olive genotypes [118,119,122,130]. Grapevine (*Vitis vinifera* ssp. *sativa*) ($n = 3$), tomatoes (*Solanum lycopersicum*) ($n = 2$), and lentils (*Lens culinaris*) ($n = 2$) are the only other crops with more than one study.

3.2.8. Local Knowledge

These studies explored knowledge related to traditional farming practices ($n = 7$), local crops ($n = 7$), and local wild plants ($n = 4$).

Traditional farming practices on the island of Pantelleria (Italy), and the factors that shaped them, such as strong winds, elevated temperatures, and water scarcity, have been extensively described [33,110,138,139]. Some authors even determined the physical basis of part of this traditional knowledge by measuring the effects of the Pantesco Garden (a drystone wall encircling a single citrus tree) on the microclimate [139,140]. The only descriptions of traditional farming techniques outside this island concern grapevine growing in Santorini (Greece) [58,70].

There is also a lot of traditional knowledge associated with local agrobiodiversity components. Several authors documented the characteristics, cultivation, traditional uses, and transformation of local landraces [35,48,109,112,113,129]. Others investigated local

knowledge related to wild edible plants, many of which are crop wild relatives of agronomic interest and are tightly connected to traditional agroecosystems [105,141–143].

3.2.9. Soil Properties and Fertilization

Studies looking at soil properties and plant fertilization were found in Greece ($n = 5$), Croatia ($n = 3$), Italy ($n = 2$), Malta ($n = 1$), and Turkey ($n = 1$). Most of these studies measured various soil parameters, including texture, pH, cation exchange capacity, organic matter, macro- and micro-nutrients, and sometimes salinity. In addition, one study checked humic substances [144], and another, the soil biological fertility (soil fauna) [145]. Their goal was to understand how cultivation practices influence soil properties [104,137,145,146], provide information for improved input management [137,147], or link soil parameter to geochemical and mineralogy features [148].

The studies in Italy regard methods for soil properties prediction [149] and for soil organic carbon mapping [150]. Lastly, one study investigated the determinants of soil erodibility [151], and two others did not measure soil parameters but looked at crop fertilization options [152,153].

3.2.10. Agriculture Revitalization and Island Sustainable Development

Studies on agriculture revitalization and sustainable development were grouped because, in marginal areas, the revival of agriculture is an integral part of sustainable development. Most studies are about Greek islands ($n = 11$), but there is a good number of publications from Italy ($n = 6$), five of which on the island of Pantelleria, as well as some studies from Croatia ($n = 3$), Spain ($n = 2$), Malta ($n = 1$), and Turkey ($n = 1$).

Three categories of studies were distinguished. The first centers on the sustainable development of islands' communities ($n = 11$) [60,138,154–162]. The second focuses on agricultural viability, looking at the success, limitations, and potential of farmers' cooperatives [163,164], marketing strategies [165,166], agrotourism [167], and an experimental center [168], or at possible development options for cultivation [98,99]. The third category is the revival of agriculture after farmland abandonment ($n = 5$) [42,137,169–171], with various articles specifically studying the recultivation of terraces [42,137,169].

3.2.11. Other Themes

Wild biodiversity (both vegetal and animal) has only been the object of nine studies, excluding the articles on crops and edible wild plants diversity. These studies mostly link farming practices and biodiversity, showing that traditional agroecosystems and/or practices support a higher flora [34,172,173] and fauna [145,172] diversity and provide more suitable habitats for bats [174,175] and red-legged partridge [96]. Furthermore, one study demonstrated that the eradication of alien predators, e.g., rats, can also bring benefits to agriculture and agri-food quality [176].

Several studies investigated the effect of climate change on agriculture, mainly related to water availability, but some also looked at temperature evolution [68,86,177] and how climate change affects crop yield and quality [81,86,177].

Barely four studies in Greece and one in Malta focus on smallholder farmers. Authors have attempted to associate characteristics of farmers (such as age, education, employment, etc.) and their farms (e.g., type, size, location) with their attitude towards climate change adaptation [177], their attitude toward environmental preservation, organic farming, and environmental programs [178], their awareness of the quality of rural products [179], or their propensity to off-farm work [61]. Another study gathered farmers' views on agricultural training in the Cyclades [180].

Plant health is another topic that was less well documented ($n = 4$). Two articles look at diseases affecting typical Mediterranean crops, such as *Fusarium wilt* on lentils [181],

or *Xylella fastidiosa* on olive, almond, and fig trees [182]. The two others linked plants' symptoms to nutrient excess or deficiency [147,183].

There are also four articles on multiple ecosystem services [43,184–186], mostly quantifying changes in the flow of ecosystem services when urbanization, abandonment, and simplification of agricultural systems take place in Greece, Italy, and Malta [43,184,185].

Lastly, two articles discuss the significance and central role of agriculture for rural communities [187,188] and one describes the situation of agriculture, relative to other sectors, with regard to land use, economic productivity, CO₂ emission, and water consumption in Menorca [189].

3.3. Research Contributions and Resulting Solutions

To better understand the contribution of scientific research to promoting the continuation or revival of agriculture in small Mediterranean islands and to addressing the different issues arising from the transformation that occurred during the last century, the articles were sorted into five categories defined as follows:

1. Informative: articles providing crucial information for further work. Such information can be gathered through, for instance, measurements, quantification, calculations, spatial analyses, predictions, interviews, field work, or data gathering.
2. Informative with suggestions: similar articles that also include substantial suggestions or policy recommendations.
3. Suggestions/recommendations: articles focusing on providing suggestions or recommendations on how to tackle an issue or achieve sustainability.
4. Exploring potential solutions: articles analyzing one or several potential innovations or solutions to an issue, for instance, by performing economic analyses, scenario comparison, cost–benefit analysis, preliminary testing, or by exploring feasibility in any other way.
5. Solutions: articles reporting on concrete actions or on-site testing of a method (pilot actions) to promote agriculture or address any agriculture-related issues.

As the boundaries between these categories can be blurry, every article's assignment was double-checked to ensure consistency.

In all countries (except Turkey), informative studies make up close to two thirds of the literature (Figure 12a). Regarding articles more oriented toward interventions, there are few or no articles on practical actions for Malta, Croatia, and even Greece, but more articles looking at potential solutions or formulating suggestions. On the contrary, in Italy, there have been more direct actions. For Turkey and even for Spain, percentages are not significant due to the low number of studies (3 and 7, respectively).

The solutions implemented, evaluated, or suggested were classified into six categories, based on the issues they are addressing (Figure 12b). Articles reporting on direct actions are largely dominated by studies aiming at the preservation of genetic resources ($n = 14$). Many solutions have been explored to support the development of agriculture, but few have been implemented. The solutions considered for the various issues are briefly described below.

3.3.1. Genetic Resources Conservation

In general, these articles report germplasm collection expeditions for ex situ conservation ($n = 13$), most often in gene banks or seed collections, and, in a single case, in a collection field [120]. These collecting missions were carried out in Italy ($n = 8$) and Greece ($n = 4$), apart from one collection of tomato seeds from the Balearics [32]. In Italy, mostly thanks to the work of Laghetti and colleagues [47,109–114], seeds have been collected on 29 small inhabited islands. On the contrary, in Greece, collection reports were found

only for five major islands: Lefkaka, Kefalonia, Lemnos, Ithaca, and Chios (only forage legumes) [35,107,108,129].

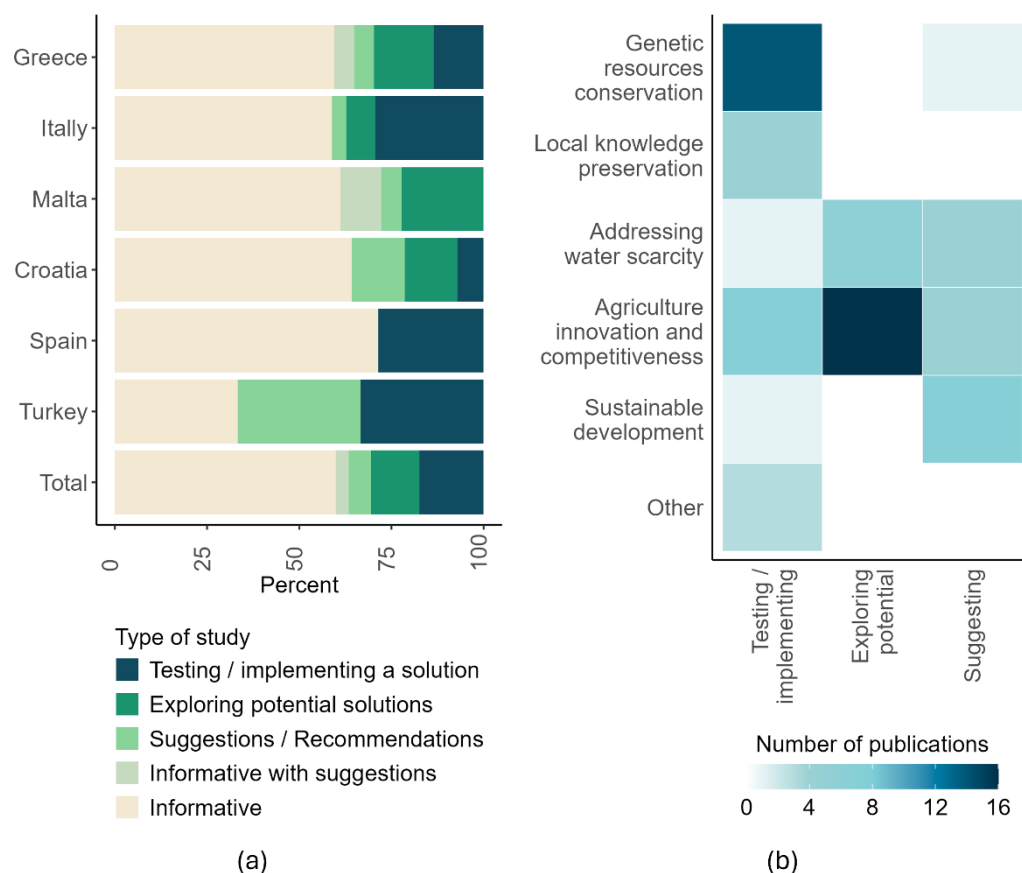


Figure 12. Research outputs in the selected bibliography. (a) Percentage incidence of the research typologies sorted by country. (b) Incidence of action-oriented studies for the various objectives identified in the literature.

The only article reporting an in situ on-farm conservation of local genetic resources is the work of Sakellariou et al. [137] who chose local landraces to restart cultivation on abandoned terraces. There was also a proposal to make Linosa island (Italy) a center for on-farm conservation of plant genetic resources [116], but to the best of our knowledge, this was not followed by a practical project.

3.3.2. Local Knowledge Preservation

Four articles carefully recorded local knowledge, mainly about wild plants in Italian [141,143] and Greek [142] islands. A recent study also documented Pantescan farmers' knowledge about cultivation techniques, grapevine and barley harvesting, and post-harvest operation, food conservation, traditional food product preparation, and domestic animals [33]. As mentioned, other authors also gathered some information on landraces as they collected seeds, but did not document it in a systematic way. Despite a general agreement that local knowledge is at risk of being lost, no studies were found focusing on know-how transmission.

3.3.3. Water Resource Management

Publications on resource management are an interesting case. Many articles provide a detailed description of the state of the current hydric resources and of how they are likely to evolve in the future. Several studies ($n = 6$) compared various drought mitigation options in terms of costs and benefits (water provided or spared); others made suggestions regarding

water resources management ($n = 4$). Yet only one study reporting on the on-field testing of a solution was found: ground-runoff harvesting in Ibiza [82].

Looking at the potential solutions assessed for addressing water scarcity, technological solutions to increase water supply have been more commonly studied: five articles discussed the potential of desalination plants [64,71,80,81,83] and evaluated wastewater treatment, either directly [64,81] for irrigation or for recharging aquifers [81]. Karavitis et al. [71] also estimated the effect of building dams and water reservoirs, drilling additional abstraction holes, and changing the irrigation system from sprinklers to drip irrigation. In contrast, just three articles looked into rainwater harvesting [64,67,81]. Lastly, two articles estimated the potential of crop substitution, but lacked precision regarding both the replaced and replacement crops: one mentioned introducing, for instance, soya [81] and the other considered replacing horticultural crops with orchards [71]. The studies comparing several methods generally report higher benefits with desalination and water recycling, while crop substitution is often found to be the least effective option [64,71,81].

Based on a SWOT analysis of the groundwater resources of Zakynthos (Greece), Diamantopoulou & Voudouris [79] formulated a combination of suggestions to improve the water quality and availability: treated wastewater for irrigation, spray or drip irrigation, ban on effluent release, creation of small retention dams in torrents, and construction of desalination plants. In another study, the Drivers–Pressures–State–Impact–Response framework was used to identify suitable responses to water-related issues in agriculture, and findings were then refined with local stakeholders [73]. The same authors also adopted a participatory approach that led to stakeholders identifying a holistic set of solutions to improve water management [84]. A last study suggested a buried clay irrigation system that will be tested on a field in Gozo in a research project [75].

3.3.4. Agriculture Innovation and Competitiveness

Studies about concrete actions for supporting agriculture and making it more sustainable from an environmental and economic perspective are scarce. Three aimed at improving plant health by finding the cause of plant symptoms [147,183] and by testing a biocontrol agent to protect a valuable local landrace from disease [181]. Two attempted to improve pasture productivity by working with farmers to introduce sown biodiverse pastures [190] and by determining the best way to control the unpalatable prickly burnet (*S. spinosum*) [173]. Another created a tool for monitoring farming practices and biodiversity [191]. Finally, Sakellariou et al. [137] boosted the recultivation of abandoned terraces through the installation of weather stations, the analysis of the soil, the implementation of a land stewardship plan, and the selection of suitable local crops.

Nevertheless, there are a number of studies exploring options for increased competitiveness. Various authors have proposed methods that could be used as a basis for local olive oil authenticity certification, which could ensure a fair price by preventing unfair competition from fraudulent products [130–132]. Others estimated the benefits of introducing mechanization on the island of Pantelleria (Italy) [46,192], although Barbera & Butera [192] found that mechanization should be combined with sustainable farming practices. The growth and productivity performances of cowpea landraces [125] and capers biotypes [123] were preliminarily assessed to determine the best material for cultivation or breeding programs.

Regarding the environmental aspect, several studies investigated the effects or potential of organic fertilization methods, such as manure, compost from agricultural wastes, or biochar [101,145,146,152,153]. Two studies showed that traditional olive grove management [174] and the introduction of inter-row grass cover in the vineyard [175] could be

beneficial for bat conservation. Panagopoulos et al. [100] predicted that soil erosion could be lessened by reducing livestock numbers and the grazing period.

Pace Ricci & Conrad [170] examined whether abandoned agricultural land could be transformed into allotment community gardens by first identifying suitable sites, checking interest from local stakeholders, and reviewing the legal and policy frameworks for land use planning to determine whether they would allow the implementation of such a project. They conclude that from a land and people perspective, the project was promising and made recommendations to remove barriers linked to the policy aspect.

A few studies made suggestions for the development or revival of agriculture. Papadopoulos & Papanikos [61] studied winegrowers in Samos and formulated suggestions to promote winegrowing. Two studies mapped the most suitable areas to restart cultivation of grapevine, olive trees, or various fruit and nut trees [42], or for various grapevine rootstocks [171].

3.3.5. Sustainable Island Development

These studies are mostly recommendations to policymakers and/or local stakeholders. The authors used different types of multidisciplinary [60,157], landscape [138,159,162], circularity [161], or land use [154] approaches to propose plans to achieve sustainable development. The only practical implementation of a sustainable development project was the creation of “Geo-Archaeo-Routes” on Lemnos [160].

3.4. European Union Research Projects

In total, 33 relevant EU-funded projects were identified for the period 2010–2025 (Appendix A, Table A1). Over half of them involve Greek islands ($n = 19$). Malta is also well represented ($n = 7$), followed by Croatia ($n = 5$), Tunisia ($n = 4$), and Spain ($n = 2$). Finally, France and Italy are both involved in one project. Almost all the projects identified were relatively recent, starting after 2010.

Most projects ($n = 10$) were funded by the Horizon 2020 Program. Its predecessor, the Seventh Framework Program, funded four of the identified projects, while its successor, Horizon Europe, funded three projects so far, but only started in 2021. The other projects were funded by LIFE ($n = 7$), ENI CBC Med ($n = 4$), the Interreg program ($n = 4$), and the IPA Adriatic CBC program ($n = 1$).

Additionally, 14 LIFE projects, which could bring benefits to agriculture, were identified but not included in the analysis as they do not specifically seek to address agricultural issues or to implement activities related to agriculture. Eleven of these are conservation projects aiming at protecting native species, notably seabirds, and ecosystems through various actions, including the eradication of black rats, which, as mentioned, can have positive outcomes for agriculture [176]. Moreover, these projects might have promoted the revitalization of agriculture by raising the awareness of local municipalities and other stakeholders on the importance of traditional farming practices for biodiversity preservation. For the island of Capraia, the cultivation of previously abandoned areas was resumed after the LIFE Capraia/Toscana project [193]. Three other projects aimed at reducing water consumption from tourism, which would alleviate pressure on water resources.

3.4.1. Project Focus

Most projects address drivers of farmland abandonment and threats to agriculture (Figure 13). Reflecting what was seen with publications, research projects in Malta mainly concern water scarcity. In Croatia, the main project focus has been counteracting rural exodus and depopulation, major drivers of agricultural decline in the country. In Greece, the project targeted multiple drivers of farmland abandonment: climate change, water scarcity, salinization, low profitability of agriculture, and rural population exodus. Even

though mass tourism on Greek islands has had a negative impact on agriculture, no project addressing this issue was found.

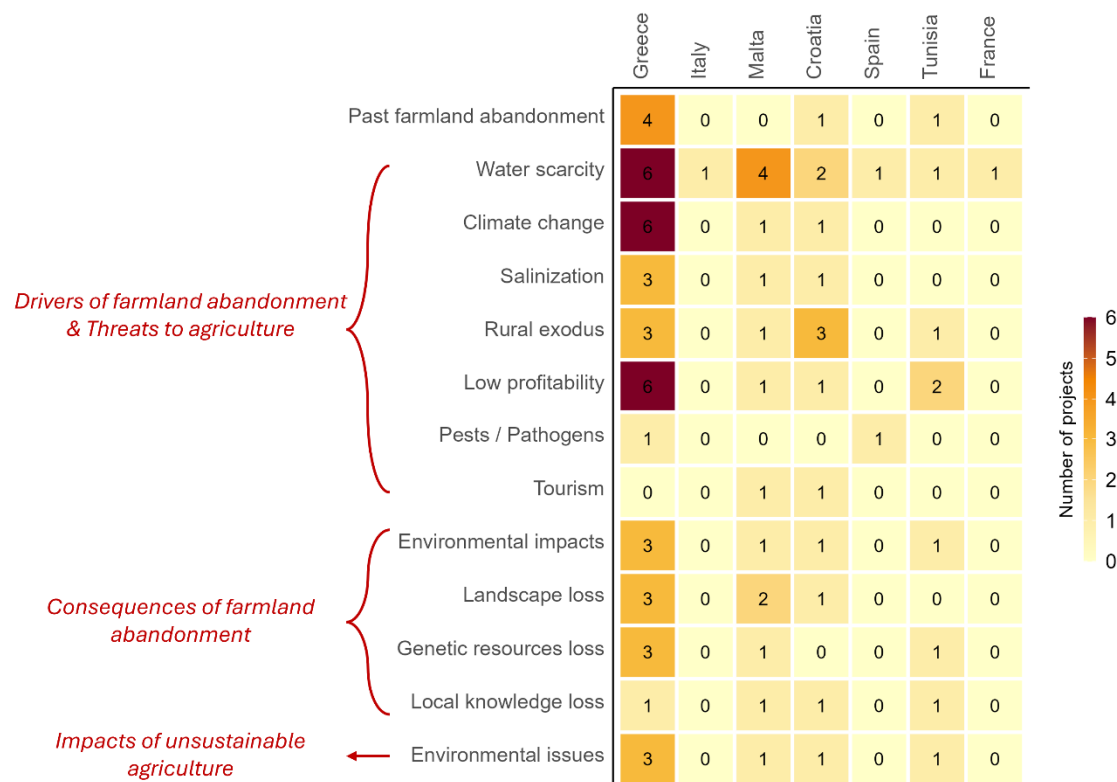


Figure 13. Frequency heatmap, by country, of the different agriculture-related issues addressed by the EU-funded research projects. Projects can address multiple issues.

Next, various projects aim to act on the consequences of farmland abandonment, such as the loss of genetic resources, landscape, and local knowledge, and negative impacts on the environment. Finally, a few projects concern, on the contrary, the effects of unsustainable practices, such as pollution or overgrazing.

3.4.2. Projects' Approaches and Solutions

In this section, solutions addressing two of the major barriers to agricultural development, i.e., water availability and profitability, will be briefly analyzed, as well as solutions directly based on farming practices. The solutions proposed by each research project are listed in Appendix A, Table A1.

As mentioned, water issues, such as water scarcity and salinization, are the most frequent threats to agriculture that projects seek to address. Two main approaches were identified: increasing water availability (by using alternative water sources or enhancing groundwater recharge) and reducing the water demand (Table 6).

To increase water availability, technological solutions are preferred, in particular, wastewater treatment. Indeed, five projects aim to use treated effluents for irrigation, and two others propose using reclaimed wastewater to recharge aquifers. Moreover, three projects suggest desalination plants as a solution. In contrast, only two projects promoting rainwater harvesting were found.

Table 6. Approaches and solutions proposed by EU-funded projects addressing water-related issues in small Mediterranean islands ($n = 10$).

Approach	Solutions Proposed	Number of Projects
Alternative water sources	Wastewater reuse	5
	Desalination plants	3
	Rainwater harvesting	2
Increased groundwater recharge	Managed aquifer recharge with reclaimed wastewater	2
	Increased water percolation	1
Water use reduction	Improved irrigation	3
	Crop choice	2
	Agroforestry	1
	Loss reduction	1
	Ecotourist loop	1
Others	Irrigation water quality monitoring	2
	Water pollution reduction	1
	Water reservoirs + supply network	1

The main solution to reduce water demand is irrigation improvement, for instance, using drip irrigation or better irrigation scheduling. Two projects propose using drought-tolerant or less water-intensive crops. Other solutions include agroforestry, reducing losses along the network, and the implementation of an ecotourist water loop.

Furthermore, to prevent irrigation with overly brackish water, two projects have implemented solutions for irrigation water quality monitoring. Lastly, one project also looks at how to reduce water pollution due to agriculture.

To enhance the value of local products, one of the most popular solutions is the creation of agrifood networks (Table 7). Additionally, the Farmpath project, although it did not aim to create an alternative network, analyzed an initiative started by local actors for the development of quality wines. It highlighted that while such initiatives can bring economic benefits to farmers, different visions coexist among the various actors, potentially creating conflicts [194].

Table 7. Strategies to increase local agri-food products' value adopted by EU-funded projects aiming at improving the economic viability of agriculture on Mediterranean small islands ($n = 7$).

Strategies	Number of Projects
Network with local actors	3
Certification, labeling	3
Synergies with tourism	3
Training (marketing, business)	2
Market expansion (international)	2
Health benefits characterization and promotion	1
Diversification	1

The establishment of certification schemes or labels certifying the authenticity and/or sustainability of the products is also often proposed. Moreover, although tourism is often listed as a driver of farmland abandonment, several projects aim to develop synergies with tourism to increase agricultural profitability. Mostly, these projects consider tourists as potential buyers, but in one interesting project, tourists are also seen as a volunteer labor force for labor-intensive activities (e.g., dry-stone wall building).

Other projects offered training in innovation, business, and marketing to help farmers develop new products and/or better sell their products. One project characterized the health and nutritional benefits of local varieties to improve their marketing, while another focuses on agroforestry as an option for diversification.

Only six projects propose farming-based solutions, mostly based on traditional practices. The Hydrousa project (Horizon 2020) also tested agroforestry, but the demonstration site was not on a larger island (Lesvos, 1600 km²). Among these projects, AndrosSPA (LIFE) and Terrace-scape (LIFE) relied on the use of local landraces. Terrace-scape also offered dry-stone wall training and implemented agroecological practices (hedgerows, crop rotation, perennial crops, leaving crop residues in place). In the LivingAgro project (ENI CBC), an agroforestry system consisting of a mixture of grass and legumes between Valonia oaks (*Quercus ithaburensis*) was tested as a way to increase forage, while contributing to wildfire prevention (shrub cleaning before sowing) and the preservation of a traditional agro-silvo-pastoral system [195]. The HNV-link project (Horizon 2020) suggested reintroducing livestock in order to restore the ecological balance and reduce the wildfire risk (encroachment prevention).

The AgroStrat project (LIFE) focuses on more intensive pistachio production. It assessed the use of compost from agricultural wastes and biochar from pistachio shells as a replacement for synthetic fertilizers. Finally, the Innov-Agro project (ENI CBC) mentioned “sustainable farming practices” as a way to increase agricultural viability and to lower its environmental footprint, but details of which practices were meant could not be found.

3.4.3. Projects’ Outcomes

Real outcomes can differ from the initial objectives of the projects. To examine this in more detail, a few projects were selected as examples. In the Hydrousa project, pilot sites of different water management techniques were implemented on different islands [196]. On the island of Tinos, small installations to collect rainwater, condense and collect water, and reclaim wastewater were constructed around a small lodge for tourists. The various installations provide about 180 m³, 4.4 m³, and 50 m³ of water per year, respectively. A 60 m² greenhouse was constructed to produce various crops using the collected water. On Mykonos, a subsurface rainwater collection system was constructed. Once in operation, the system collected 60 m³ a year. An oregano field of 0.4 ha was planted and irrigated with the collected water, producing 50 kg of oregano. A facility was renovated and used to produce essential oils. Also on Mykonos, a bioswale system was constructed and has been collecting up to 250 m³ of rainwater/ stormwater. Most of the water is used to irrigate 0.2 ha of lavender, producing 1000 kg/year of lavender to be used for essential oil production. Furthermore, two other pilot sites on the large island of Lesvos demonstrated the feasibility of an agroforestry system and of a sewage treatment system. Considering the success of the different pilots, replication studies are being implemented on other islands [196]. Therefore, the Hydrousa project seems to have reached its objective and to have concretely contributed to addressing the water scarcity issue using small-scale installations providing alternative water sources.

The project “Innovative management of the suburban area ‘Kastrominas’ of the municipality of Chios” (Acronym: Chios) aimed at developing and demonstrating a sustainable citrus farming method and soil conservation activities, creating sustainable cultural and leisure activities, raising awareness about how agriculture can cause environmental degradation and more environmentally friendly practices through the creation of an Environmental Awareness Center, and conducting an environmental impact assessment [197]. Most of these objectives were fulfilled. However, the construction of the center was not completed during the project time frame, and planned works related to landscape remediation and regeneration of natural vegetation could not be implemented due to delays at the start of the project [197]. Moreover, the original idea of building a soil laboratory was abandoned. On the other hand, the realization that water scarcity would be a serious issue prompted the implementation of unplanned activities: the construction of a water supply network, a

reservoir, an underground reservoir, and a pump room, as well as the demonstration of sustainable water management techniques [197].

On the island of Andros (Greece), three LIFE projects represent a unique case (within the identified projects) of complementarity and continuity between projects. The project AndrosSPA (LIFE) aimed at improving the management of a Natura 2000 area to protect alluvial forests and native bird species, but actions carried out during the project included the revitalization of terraced fields with traditional crop farming [198]. The subsequent Terracescape project (LIFE) could thus use the knowledge acquired during the AndrosSPA (LIFE) project to successfully revitalize agriculture on a larger scale, achieving the recultivation of over 115 ha [199]. The Terracescape project (LIFE) fulfilled many of its goals, as drystone walls were rehabilitated, local crops were cultivated, a meteorological station was installed, and biodiversity, soil fertility, and microclimate were improved in the recultivated terraces [199]. However, difficulties were encountered regarding one of the main objectives, i.e., the deployment of the Land Stewardship approach [199]. Finally, the third project, Andros Park (LIFE), continued the work of AndrosSPA (LIFE), working toward the preservation of alluvial forest, birds, and monk seals [200]. During the project, a botanical garden was created, contributing to the preservation of genetic resources of agricultural importance, such as local fruit trees, olive trees, and aromatic plants [201].

4. Discussion

Agricultural marginal lands can contribute significantly to the development of more sustainable food systems [202] and regenerative landscapes [203]. Small Mediterranean islands are emblematic marginal areas, where changes in agricultural land uses during the last decades have led to the homogenization of landscapes and the loss of economic, ecological, and cultural functions. In an effort to help researchers interested in this topic, this systematic review gathered and analyzed the existing literature on agriculture on small Mediterranean islands. The following sections will discuss the various research gaps identified.

4.1. Small Islands as Study Cases

Until about 20 years ago, academic research on this topic was virtually non-existent. Even nowadays, relevant scientific literature is relatively limited. Moreover, several gaps in the geographical distribution of case studies were identified.

Firstly, some countries are underrepresented. Croatia has attracted relatively few studies and research projects, considering it has numerous populated islands, on which agriculture usually faces many challenges (e.g., depopulation, land fragmentation, ownership issues, international competition). Likewise, the number of articles on the few Spanish-populated Mediterranean small islands is very limited. Tourism exerts a great pressure on the Balearic islands; in Ibiza in particular, agriculture has drastically decreased during the last decade, with a reduction in the utilized agricultural area of 70% from 2014 to 2023 [204]. On the other hand, Menorca could represent a “success story” as farming and traditional landscape mosaic have been preserved in spite of tourism, perhaps favored by the presence of an agricultural research center [205] and the efforts of a local association toward the development of a resilient and sustainable agriculture [206].

Furthermore, no publications and only one research project (Hydrousa) related to islands’ agriculture were found for France, most likely because French islands in the Mediterranean are few, very small, and not very populated. Nevertheless, at least on some islands, local communities or initiatives are ensuring the perpetuation of agriculture and the preservation of genetic resources [207,208]. More strikingly, no publication and only four research projects on Tunisian islands were found. The lack of research articles on

Tunisian island agriculture might be linked to the complex political context of the country, the minor interest of the state in marginal areas, and rainfed agriculture [209], and/or the socio-economic difficulties faced by Tunisian researchers, hampering the publication process [210]. The Kerkennah archipelago greatly suffers from farmland abandonment as a result of water scarcity, salinization, and low profitability [211]. The cessation of traditional agricultural practices, which had been preventing the extension of soil salinization, causes severe land degradation [211]. Likewise, agriculture, especially traditional practices, has been declining in Djerba since 1960, and suffers from a range of issues including salinization, mass tourism, urbanization, land fragmentation, and ownership issues [212–214]. The decline and modernization of agriculture put the genetic resources and agricultural local knowledge associated with Tunisian islands at risk. Indeed, in Djerba, previous knowledge regarding adaptation to hot and dry conditions, notably through traditional water management (including rainwater harvesting and storage) and traditional spatial arrangement of plants, has been declining [215]. Another example of local practice is the interesting use of olive leaves by sheep breeders of the Kerkennah islands to feed their herd, which reduces the need for fodder [216]. Moreover, the Kerkennah archipelago still holds precious genetic resources, notably for grapevine, as acknowledged by the Slow Food association, which promotes local agri-food traditions and communities worldwide [217]. The need for more scientific attention on Tunisian islands' agriculture thus appears rather urgent.

Secondly, some regions are underrepresented. For example, Italian small islands have been generally well studied, but nothing was found for islands around Sardinia, which are rendered vulnerable by the double insularity phenomenon. In Greece, the Saronic, Sporades, and Dodecanese islands are clearly understudied in respect to other archipelagos. The Dodecanese especially are very remote islands; one of the few articles on this archipelago reports a very strong farmland decline [39], highlighting the need for revitalization efforts.

Lastly, there is a need for more research on very small islands (<50 km²). Except perhaps in Italy, these islands have received far less attention than larger ones, which is problematic as they might be subjected to greater pressures, such as more limited resources, smaller markets, lack of infrastructure, etc.

4.2. Research Themes and Research Gaps

Studies focusing on specific crops are mostly concerned with vineyards and olive groves, emblematic Mediterranean landscapes. Nevertheless, cereals, pulses, and vegetables, which were commonly cultivated in the past, are of great value due to their role in ensuring food security and sovereignty, their deep connection to the local culture and traditions, and their special traits, as many landraces are adapted to harsh conditions. The EAT-Lancet Commission, which developed recommendations to achieve healthier diets and more sustainable food systems, underscored the importance of the consumption of vegetables, whole grains, and legumes consumption [218]. Moreover, pulses, vegetables, and fruits have also been recognized as strategic crops for improving human health and food systems sustainability by the Food and Agriculture Organization of the United Nations (FAO) [219,220]. Last but not least, the role of legume cultivation in supporting sustainable agriculture is well known (see, e.g., [221,222]); in Mediterranean islands, benefits could be great as soil organic carbon and nitrogen are typically low, as highlighted by the soil properties studies in the analyzed bibliography. Therefore, there is an urgent need for more research efforts toward the preservation and revitalization of these crops, especially as they tend to be abandoned first, sometimes in favor of permanent agroecosystems, such as vineyards, olive groves, and, in particular, small ruminant farming, all of which are

more profitable and better suited for part-time working and employment in the tourism sector [25,33–38,55,99,109].

The selected literature covers a large variety of topics, with a special emphasis on agrobiodiversity, water resources, local knowledge, and the transformations that occurred in agricultural systems since the mid-nineteenth century, including what caused them and what impacts they had on the environment. The research projects listed reflect some of these concerns and principally aim to address water-related issues, increase the profitability of agriculture, adapt to climate change, increase agricultural sustainability, preserve landscapes, and prevent the loss of genetic resources. Two research areas that might deserve more attention are plant health and ecosystem services.

It is difficult to estimate the current losses due to pests and pathogens on Mediterranean small islands; the rarity of publications on this field might indicate a limited impact at the moment, although biotic factors might represent a future risk for the resilience of agriculture. Studies on ecosystem services could be valuable for assisting policymakers in appropriately balancing ecological, social, and economic functions when developing management plans. In particular, efficient landscape management planning requires the involvement of local stakeholders. In this context, the ecosystem services framework is an interesting tool to guide the participatory process, understand the trade-offs between ecological, social, and economic values, and discuss seemingly conflicting stakeholders' views [2].

However, even if topics were overall well covered, this analysis highlighted some country-specific gaps. For instance, studies on the drivers that brought changes to agriculture are lacking for all countries but Greece and Croatia. This is particularly surprising for Italy, considering the number of studies and the extent of farmland decline in the country. Even if the changes in agriculture have similar underlying causes across the Mediterranean Basin, there are differences between islands. For instance, on some islands, farmland abandonment was primarily triggered by tourism, whereas on others, it occurred even in the absence of tourism. Therefore, findings cannot be generalized, and more site-specific analyses have to be implemented. Yet, understanding the drivers that brought about changes is paramount to identifying the policies and actions that would have the most leverage for promoting the revitalization of agriculture. On this matter, it should be noted that while many articles sought to recognize drivers of change, none investigated in detail the current barriers to agriculture revival.

Water scarcity is a serious issue in the Mediterranean region; on small islands, it represents an even greater problem, as shown by the many studies on water availability analyzed here, since precipitation is typically low, surface water bodies are often absent, and pressure from tourism is greatest when crops' needs are at their peak. Italian islands are no exception, yet very little has been found for Italy on this topic.

To date, agrobiodiversity has been thoroughly investigated only on Italian islands and on a few major Greek islands. The loss of crop and wild crop relative diversity has been occurring worldwide, raising concerns since the 1980s [223]. In the context of a rapidly changing climate, food security becomes increasingly dependent on a wide gene pool diversity to breed crops resistant to pests, diseases, and abiotic factors [224–227]. Landraces, and even more so crop wild relatives, hold much of this taxonomic and genetic diversity, making their conservation an absolute priority [224–227]. It is well known that the Mediterranean region is an important biodiversity hotspot. It is also one of the centers with the highest crop wild relative species richness [228,229], and crop genetic resources are generally considered better preserved on islands than on the mainland because of the limited development of intensive agriculture, the isolated character of islands, the special environmental conditions, the deep cultural attachment to agriculture, and a delayed

adoption of modern cultivars. In light of this, efforts at characterizing and safeguarding agrobiodiversity in other countries, as well as on smaller Greek islands, would in all likelihood be of considerable value.

Similarly, local traditional knowledge and farming practices, which have been recognized as instrumental for the resilience of agriculture to global climate change around the world [230–233], have also been studied on a limited number of islands. Traditional farming practices, in particular, have been extensively described only for Pantelleria (Italy) and somewhat for Santorini (Greece). Information from more locations would be of interest.

4.3. Research Impacts and Transferability

Despite various research gaps, academic research has provided a substantial body of knowledge regarding agriculture on small Mediterranean islands. However, when it comes to taking real actions, the means of research are sometimes limited, and researchers can chiefly make suggestions and recommendations for policymakers at the local, national, and European levels.

This is, for instance, the case for water resources management at the island level, which ultimately depends on local authorities, or for land use studies, that might very well define the best areas for various land uses, including those for the revival of agriculture, but cannot guarantee that the plan will be adopted (see, e.g., [42]). Another example is island sustainable development studies. For instance, of the 50 actions recommended by Tatsis et al. [60], for the sustainable development of Agios Efstratios, many depend on the local authorities, in particular those related to funding and infrastructure. This might explain why the analysis of the bibliography revealed a lot more studies describing, quantifying, predicting, making suggestions, and assessing possible solutions than studies about direct interventions. Nevertheless, significant outcomes for the preservation and revival of agriculture can still be achieved by working with local communities, as demonstrated by Sakellariou et al. [137] within the Terrace-scape project (LIFE). In that line of research, an interesting approach bringing together farmers, scientists, policymakers, and other local actors to develop and implement sustainable solutions and innovations for agriculture through a participatory process could be the concept of Living Lab (see, e.g., [234]).

There are also many successful examples of non-academical initiatives for agriculture preservation, carried on by or with local stakeholders, to learn from: the work of the “Oro di Capri” association [235], described and analyzed by Sanità [169], and of the “Attiva Stromboli” association [236], briefly described by Biasi et al. [237], on the Italian islands of Capri and Stromboli, respectively; the Land stewardship scheme implemented on Menorca by the Grup Balear d’Ornitologia i Defensa de la Naturalesa (“Balearic Group of Ornithology and Defense of Nature”) together with local farmers [206]; the work of the Association pour la Sauvegarde de l’Île de Djerba (“Association for the Safeguarding of Djerba island”) in Tunisia [238]; and the extensive work of the Mediterranean Institute for Nature and Anthropos (MedINA) on Greek islands (especially Lemnos and Kythera) [239]. Although they do not focus specifically on agriculture, the SMILO (Small Islands Organization [240] and PIM (Petites Îles de Méditerranée, “Small Mediterranean Islands”) [241] associations, working for the sustainable development and preservation of small islands, have also implemented, together with local communities, various actions supporting local farmers.

Another lesson that can be drawn from these associations is the importance of adopting an integrated approach. The MedINA projects on Lemnos, for instance, interact with each other and act on multiple leverage points to support agriculture on a given island. Together, they aim at the conservation of local landraces, the certification of local products, the promotion of biodiversity-friendly practices, know-how transmission, education, the valorization of traditional handicraft and food products, integration with tourism, and

innovations in farming practices [239]. In contrast, most studies testing or formulating actions for improvement focus on a single issue and one type of solution, and the scope of some projects appears limited.

Although research projects appear to have fulfilled at least partially their objectives, their long-term impact and their real contribution toward the achievement of resilient and sustainable agriculture are difficult to assess due to the lack of data. However, it seems unlikely that a project focusing, for instance, only on water provision would be sufficient to support local agriculture if other barriers are not removed.

Regarding the solutions that have been proposed to support agriculture and/or address issues arising from its abandonment/intensification, several weaknesses were observed. First of all, many autochthonous plant genetic resources have been collected on Mediterranean islands to be stored in ex situ collections. However, the value of landraces largely lies in the fact that they are dynamic resources that have evolved throughout the years through careful farmers' selection, thus continuously adapting to local conditions [242]. In gene banks, their evolution is "frozen". Landraces can also present a high genetic variability (e.g., as illustrated for the lentil landrace 'Eglouvis' (Lefkada island, Greece) [127]) that might not be entirely reflected by the gene bank's accessions. In addition, in situ conservation is also of the utmost importance for the preservation of crop wild relatives (recalcitrant species, for instance, are difficult to conserve in gene banks) [226]. Therefore, without denying the critical role of gene banks for ensuring the long-term conservation of genetic resources and making them more easily accessible, on-farm conservation should not be neglected, especially for landraces (in that sense, a framework described by Maxted et al. for on-farm conservation projects could be of major interest [243]). In addition, the added value of the in situ on-farm conservation is the preservation not only of biological systems, but also of traditional practices and, in particular, of traditional agricultural landscapes.

Yet, from the selected bibliography, only one example of the promotion of in situ-on farm use of local landraces was found [137]. This study was part of the Terrace-scape (LIFE) project, which, like its predecessor AndrosSPA (LIFE), planned the use of local landraces for the recultivation of abandoned terraces. In addition, four projects aimed to valorize local products through certification and/or label schemes, thereby also promoting the use of local genetic resources, even though their actual impact is not known.

A parallel can be made between the situation for genetic resources and local knowledge. Several authors recorded local knowledge from farmers of the islands, similar to seed collection and storage in gene banks. Like with genetic resources, publications and projects aiming at the "on-site" transmission and use of local knowledge are lacking. This is especially important as farmers' aging is a widespread phenomenon and most local knowledge resides with aged farmers, who often have no successors. Two exceptions were found: the Terrace-scape project (LIFE), during which a dry-stone wall school was created, and the MedSNAIL project (ENI CBC Med), which strived to valorize local culinary products, and, with them, the traditional methods associated with the preparation, the knowledge of which is sometimes retained by just a few people.

Promising results have been reported from the revival of traditional practices, sometimes with some adaptations or innovation, as with the renewed interest in the traditional use of cereals intercropped with grapevines and vegetables on Pantelleria [33], the restoration of terraces using traditional methods of dry-stone wall building and subsequent recultivation with local crops (Terrace-scape project, [76]), the recovery of ancient olive groves and their management following the traditional model of olive cultivation on Capri island [169], or the legumes/cereals and oaks agroforestry system for grazing and feed production in Kea (LivingAgro project). Yet, few projects/ articles focus on the preservation

of traditional practices. Certainly, more in-depth studies about traditional agroecosystems and practices and efforts toward their preservation, adaptation through innovation, and diffusion would be highly valuable, possibly even beyond small islands, for small family farms' resilience, especially in view of the ongoing climate emergency.

As far as the water resources' management solutions, most studies addressing water issues recommend the construction of desalination plants, but do not seem to consider the high energy requirement of the desalination process and the negative impacts of the generated brines on aquatic ecosystems [244,245]. Reuse of treated wastewater for irrigation is also a common recommendation. Nevertheless, authors who evaluated the potential of this solution did not mention possible adverse environmental and public health impacts. Treated wastewater can present salinity issues and contain pharmaceuticals, heavy metals, microplastics, and other chemical and biological pollutants [246–249]. Short-term studies in the Mediterranean region report mostly benefits to using treated wastewater (see, e.g., [250–252]. However, long-term irrigation of olive trees with treated wastewater was shown to lead to heavy metal accumulation in fruits [253]. Moreover, it must be remembered that wastewater treatment plants on islands might only be equipped to perform basic treatment, which is not sufficient for reuse in agriculture [254]. On Mediterranean islands, where water scarcity is particularly acute, desalination and water recycling appear as obvious and desirable solutions. Nonetheless, studies on water resources management should be clearer about the requirements, costs, and potential impacts of implementation. The recovery of traditional practices for water interception and storage is generally gaining attention. However, on small Mediterranean islands, rainwater harvesting is largely understudied. Even though the harvesting potential might diminish in the future [67], rainwater still represents a valuable resource to take advantage of. Surprisingly, only one study suggested the construction of small retention dams on torrents [71], a nature-based solution that has proven successful in providing irrigation water, supporting biodiversity, and enhancing groundwater recharge on several Greek islands [255,256] and thus deserves more attention.

The findings of this analysis regarding the prevalence of “informative” studies and the lack of action-oriented studies and farmers' involvement are in line with the conclusion of Cicinelli et al. [257] who conducted a literature review of terrace agriculture in the Mediterranean region and found that most studies analyzed terraces and their influence on soil and water, but few actually suggested strategies for their preservation or restoration or even involved farmers.

Moreover, interconnected research actions, as well as expertise and experience sharing between researchers working on islands facing similar challenges, would certainly be beneficial, but the co-authorship network and the fact that most projects include islands from a single country suggest that such collaborations are currently limited. Furthermore, research often lacks the continuity in time required to make an impactful difference. Indeed, most projects last about 3–4 years, and the co-authorship network hints at time-limited researchers' involvement.

4.4. Research Limitations

A limitation of this study might be the exclusion of publications not written in English. However, taking into account that: (i) apart from Malta, none of the Mediterranean countries have English as official language, (ii) most scientific publications being written in English only a few otherwise relevant articles were excluded on the language basis, and (iii) the information contained in non-English publications was sometimes included in English articles published subsequently, the potential bias in the results due to this exclusion is expected to be minimal.

Furthermore, for the research project analysis, this review focused exclusively on projects directly funded at the EU level, mainly due to difficulties in listing other projects (language barriers, lack of databases). Thus, it should be remembered that the results presented do not reflect the whole picture with regard to the countries and topics being the objects of research projects. For instance, in Italy, the ongoing Agritech project (National Research Center for Agricultural Technologies), funded by the European Union Next-Generation EU (National Recovery and Resilience Plan, PNRR—NRRP), is supporting a Living lab on the small island of Ventotene (central Tyrrhenian Sea) to help small farmers adapt to climate change by enhancing local knowledge of microclimate and soil characteristics. Furthermore, this review focuses on academic research, yet it should not be forgotten that efforts toward the achievement of sustainable and resilient agriculture in small Mediterranean islands have also been made by other institutions, associations, local stakeholders, and local authorities. Examples of such actors, which could be valuable for interested researchers, were provided in the previous section.

5. Conclusions

Regardless of the trajectory taken, recent transformations are threatening the sustainability of small Mediterranean islands' agricultural systems. Indeed, farmland abandonment, which might bring some environmental benefits through the recovery of natural vegetation, causes landscape homogenization, and the loss of valuable plant genetic resources and wild biodiversity, local knowledge and farming practices, and, sometimes, cultural identity. The shift to husbandry, generally accompanied by overgrazing, ultimately lowers pasture productivity and causes land degradation, while intensification leads to soil and water pollution and increased pressure on already dwindling water resources.

Yet, small islands continue to represent areas of significant natural value, where, for now, some traditional agricultural systems that are, by nature, environmentally friendly, continue to exist. The support of these traditional agroecosystems, and their continuous improvement through technological innovations, can help the development of sustainable communities, the preservation of their cultural heritage, and the enhancement of natural capital. By analyzing the existing literature and identifying research gaps, this systematic review offers a solid basis for advancing research toward the preservation, revitalization, and sustainable development of agriculture on small Mediterranean islands.

Supplementary Materials: The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/land14091874/s1>, Table S1—List all the work of the selected bibliography analyzed in the systematic review.

Author Contributions: Conceptualization, R.B. and M.G.; methodology, M.G.; formal analysis, M.G.; investigation, M.G.; resources, M.G.; data curation, M.G.; writing—original draft preparation, M.G.; writing—review and editing, M.G. and R.B.; visualization, M.G.; supervision, R.B.; project administration, R.B.; funding acquisition, R.B. All authors have read and agreed to the published version of the manuscript.

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Data Availability Statement: Data regarding article classification and analysis will be available upon reasonable request.

Conflicts of Interest: The authors declare no conflicts of interest.

Appendix A

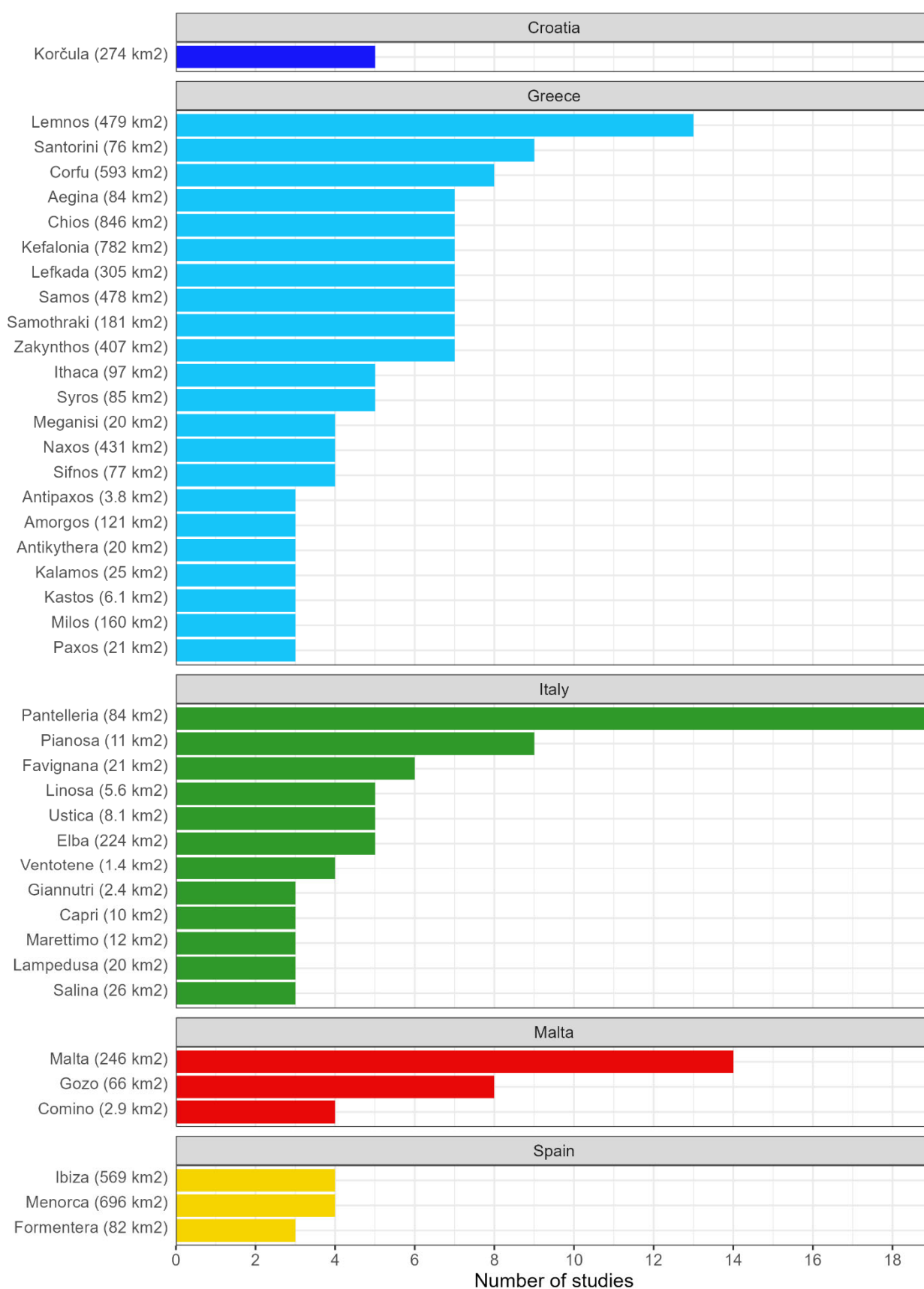


Figure A1. Most frequently studied islands by countries. Only islands present in at least three publications are shown.

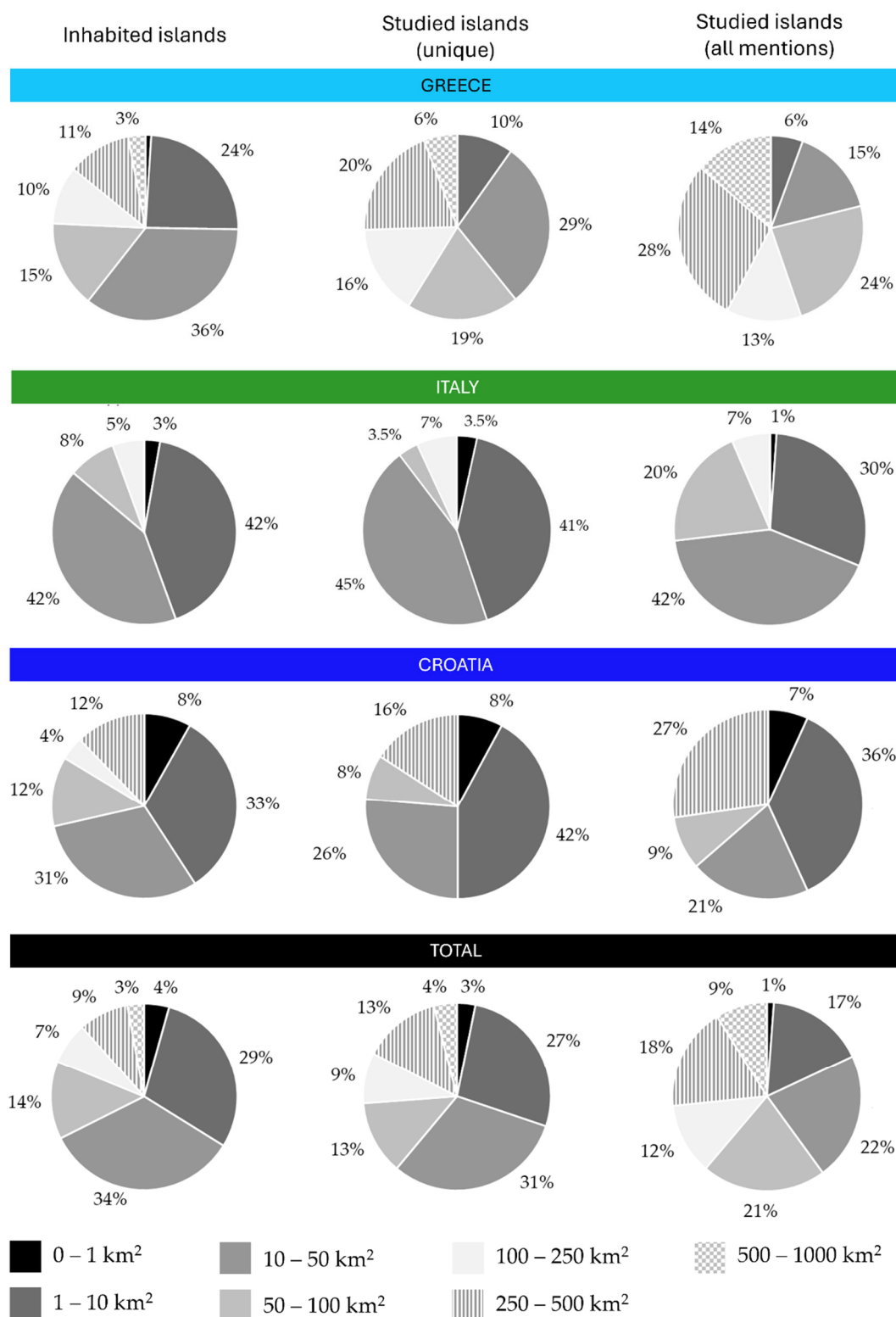


Figure A2. Islands' distribution in size classes and percentages of study case for each island's size class.

Table A1. EU-funded academic research projects addressing issues related to agriculture on small Mediterranean islands.

Projects	Small Islands	Issues Addressed	Solutions
Horizon Europe Projects			
TerraForm 2025–2030 doi.org/10.3030/101171158 (accessed on 20 July 2025)	Malta	Climate change Soil erosion Flooding Terraces loss	Study past impacts of terraces to inform sustainable practices
Georgia 2025–2028 georgia-horizon.eu (accessed on 20 July 2025)	Santorini	Water scarcity Salinization	Water recycling Irrigation network Smart irrigation system
ICARIA 2023–2025 cordis.europa.eu/project/id/101093806 (accessed on 20 July 2025)	South Aegean islands	Climate change	Climate change scenarios and resilience assessment models Adaptation solutions
Horizon 2020 projects			
Hydrousa 2019–2023 www.hydrousa.org/ (accessed on 19 August 2025)	Pilot: Mykonos, Tinos Transfer: Zlarin, Balearics, Porquerolles, Kerkennah islands, Tuscan islands	Water scarcity	Wastewater treatment Agroforestry Rainwater harvesting Desalination units combined with greenhouses Ecotourist water loops
Incredible 2017–2020 www.incredibleforest.net/ (accessed on 20 July 2025)	Cres, Krk, Pag	Rural exodus	Training on harvest practices and uses of NWFPs Promotion of NWFPs
G2P-SOL 2016–2021 https://www.g2p-sol.eu/ (accessed on 20 July 2025)	Amorgos, Chios, Ikaria, Kos, Lemnos, Leros, Milos, Naxos, Paros, Santorini, Skopelos, Syros, Corfu	Genetic resources loss Pests and pathogens Climate change	Germplasm identification and characterization Varietal improvement Making genetic material available
Simra 2016–2020 (accessed on 20 July 2025)	Cres	Depopulation/rural exodus Farmland abandonment	Better integration of returning migrants coming to cultivate lands
XF-ACTORS 2016–2020 www.xfactorsproject.eu (accessed on 20 July 2025)	Menorca, Ibiza, Formentera	Pathogen	Early detection methods Resistant genotypes Control
HNV-Link 2016–2019 www.hnvlink.eu/ (accessed on 20 July 2025)	Brač, Hvar, Šolta, Vis, Mljet, Lastovo, Korčula	Biodiversity loss Soil erosion Landscape mosaic loss Local knowledge loss Depopulation/rural exodus Low profitability Tourism-driven urbanization	List innovation examples from the area and beyond, to assess outcomes, enabling factors, limitations, and reproducibility
FOWARIM 2016–2018 https://cordis.europa.eu/project/id/692162 (accessed on 19 August 2025)	Malta	Water scarcity Pollution due to agriculture	Reduce agricultural water demand Alternative water sources On-farm desalination Pollution reduction
ESMERALDA 2015–2018 esmeralda-project.eu/ (accessed on 20 July 2025)	Malta	Landscape loss Tourism-driven urbanization	Ecosystem services mapping and assessment Policies recommendations
Traditom 2015–2018 traditom.eu/ (accessed on 20 July 2025)	<i>Varieties from various islands</i>	Genetic resources loss Low profitability	Varietal improvement Identification, characterization, valorization of local varieties
Water4Food 2016–2017 doi.org/10.3030/736282 (accessed on 20 July 2025)	Malta	Water scarcity	Desalination

Table A1. Cont.

Projects	Small Islands	Issues Addressed	Solutions
Seventh Framework Program			
ENVIEVAL 2013–2015 envieval.eu/ (accessed on 20 July 2025)	Santorini	Landscape loss Rural exodus	Evaluation of environmental impacts of rural development measures and programs
FARMPATH 2011–2014 farmpath.hutton.ac.uk/ (accessed on 17 August 2025)	Santorini	Low profitability	Analysis of an alternative agrifood network initiative
MARSOL 2011–2014 cordis.europa.eu/project/id/619120 (accessed on 20 July 2025)	Malta	Water scarcity Salinization	Managed aquifer recharge using treated effluents
WASSERMED 2010–2013 cordis.europa.eu/project/id/244255 (accessed on 20 July 2025)	Syros	Climate change Water scarcity	Assessing the impact of climate change on agriculture Cisterns Water recycling
Life projects			
RBMP 2018–2025 rbmplife.org.mt/ (accessed on 20 July 2025)	Malta, Gozo	Water scarcity	Managed aquifer recharge using treated effluents Increased water use efficiency Wastewater recycling
Terrace-scape 2017–2022 lifeterracescape.aegean.gr/ (accessed on 19 August 2025)	Andros	Genetic resources loss Landscape loss Soil erosion Local knowledge loss Terraces abandonment Low profitability Climate change	Local product valorization (certification) Local variety propagation Dry-stone wall training Sustainable farming practices Decision support tool to identify suitable areas for recultivation Automatic meteorological station (live, publicly available) Terraces restoration/recultivation Watermill restoration (for cereals) Honeybee house restoration
Andros Park 2017–2022 life-androspark.gr/en/ (accessed on 19 August 2025)	Andros	Soil erosion Biodiversity loss Terraces abandonment Genetic resources erosion	Terraces restoration Botanical garden
AgroStrat 2012–2017 https://webgate.ec.europa.eu/life/publicWebsite/project/LIFE11-ENV-GR-000951/sustainable-strategies-for-the-improvement-of-seriously-degraded-agricultural-areas-the-example-of-pistachia-vera-l (accessed on 9 September 2025)	Aegina	Water scarcity Salinization Soil fertility	Improving degraded soils with agricultural wastes Decision making and monitoring tools and platform Field equipment for farmers
AndrosSPA 2011–2017 www.androslife.gr/ (accessed on 19 August 2025)	Andros	Biodiversity loss Genetic resources loss Terraces abandonment	Local crops cultivation Terrace agriculture revitalisation
Chios 1999–2002 webgate.ec.europa.eu/life/publicWebsite/project/LIFE99-ENV-GR-000547/Chios (accessed on 19 August 2025)	Chios	Agriculture environmental footprint Water scarcity	Environmentally friendly practices Water reservoir and supply network
Conservation and rehabilitation of fragile insular ecosystems 1998–2001 https://webgate.ec.europa.eu/life/publicWebsite/project/LIFE97-TCY-TN-055/Conservation%20and%20rehabilitation%20of%20fragile%20insular%20ecosystems (accessed on 18 August 2025)	Kerkennah islands	Low productivity Agriculture abandonment Biodiversity loss	Rehabilitation of a palm tree plantation Creation of an experimental orchard

Table A1. Cont.

Projects	Small Islands	Issues Addressed	Solutions
Interreg projects			
Adrural 2024–2027 adrural.interreg-ipa-adrion.eu (accessed on 20 July 2025)	Ionian islands	Depopulation	Empowering rural communities through community-led innovation and Smart solutions
Innovagro & Innovagro Plus 2017–2019 & 2022 innovagro.adrioninterreg.eu/ (accessed on 19 August 2025)	Ionian islands	Low profitability Agriculture environmental footprint	Synergies agriculture/tourism Extended market (international) Sustainable farming practices Support innovations and business development
Agro-identify 2017–2021 agrotautotita.eu/en/ (accessed on 20 July 2025)	North Aegean islands	Low profitability Rural exodus	Documenting authenticity of local products (certification) Training in business management and marketing
INNONETS 2018–2021 https://keep.eu/projects/26617 (accessed on 18 August 2025)	Ionian islands	Low profitability	Support innovations from micro and small agrifood enterprises Local agrifood networks
ENI CBC Med projects			
ENSERES 2021–2023 enicbmed.eu/projects/ensere (accessed on 20 July 2025)	Kerkennah islands	Biodiversity loss due to unsustainable practices	Lowering impacts of agriculture on marine ecosystems
MedSnail 2019–2023 www.enicbmed.eu/medsnail (accessed on 20 July 2025)	Gozo, Kerkennah islands	Low profitability Rural exodus Genetic resources loss Traditional products loss Local knowledge loss	Local products valorization: labels, network with chefs and local markets, governance structures creation
Co-Evolve4BG 2019–2023 www.enicbmed.eu/projects/co-evolve4bg (accessed on 20 July 2025)	Samothraki *	Unsustainable practices Soil erosion	Identification of environmental issues linked to agriculture
LivingAgro 2019–2022 www.livingagrolab.eu/ (accessed on 20 July 2025)	Kea	Low profitability Traditional silvopastoral system loss	Re-using traditional agroforestry systems for product diversification and increased sustainability
IPA Adriatic CBC projects			
DRINKADRIA 2013–2016	Korčula, Corfu	Water scarcity Climate change Salinization	Analyze precipitations, water availability, temperature changes Reducing water loss Improve the hydraulic simulation model of water distribution

* The project is also in Djerba, but does not involve agriculture there.

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