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Hilly, Semi-Mountainous and Mountainous Areas Harbor Landraces Diversity: The Case of Messinia (Peloponnese-Greece)

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Abstract: Landraces are identified for their genetic diversity and heritage value. Geographically isolated areas are gradually recognized for their agricultural diversity and importance in conservation. One of the consequences of agricultural intensification is an increase in crop uniformity and hence a reduction in the landraces' genetic resources. Messinia, located in Southwest Peloponnese, Greece, is characterized by a diverse terrain and smallholdings. The geomorphological character of the area and farmers' selections have led to new landraces (local varieties) with unique traits and specific adaptations. A total of 110 villages/settlements were visited between 2013–2016, aiming to explore the existing wealth of landraces and the degree of genetic erosion. The genetic material collected and the testimonies extracted from local communities were compared to data from past expeditions, gene banks, and portal databases. Of the 427 collected samples, the majority belonged to annual vegetable or pulse species, indicating the genetic diversity of the groups, which was likely related to their culinary value. Perennial crops are priced both as commercial and staple crops, with olive trees dominating the agricultural landscape. Genetic erosion and production decline were noticed for cereals. It is concluded that socio-cultural and agricultural trends have a strong influence on the survival of landraces. Without exhausting the agricultural wealth of the region, the present study suggests that Messinia is an agrobiodiversity hotspot that includes neglected crops.

Keywords: agrobiodiversity; conservation; neglected species; mountainous areas; grapevine varieties; landraces; local varieties; local populations; indigenous varieties

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1. Introduction

> "Then lovely Polycaste, Nestor's youngest daughter, bathed Telemachus. And when she had bathed him and rubbed him with oil, and dressed him in tunic and fine cloak, he emerged from the baths like an immortal and seated himself by Nestor, the people's shepherd".
>
> (Homer: The Odyssey, Rhapsody 03, verses 464–469, 6th BCE, Translated by Kline [1], 2004).

This Homer quotation could be the first alphabetic reference to the word "oil" (meaning olive oil), indicating the cultivation of olive tree landraces in the region, specifically at the Palace of King Nestor, located in Pylos of Messinia in antiquity.

Geographically isolated areas are increasingly recognized for their agricultural diversity and their importance in genetic resources conservation efforts [2–4]. Landraces (local populations, local varieties) are usually identified by local names. In the present paper the term 'landraces' is used for both annual and perennial indigenous varieties. Apart from their value in crop breeding programs and evolution studies, they are intrinsically related to regional cultural life and heritage [5]. Landraces still play an important role in the life of many local communities and their agricultural systems, and their utilization can be considerably valuable for the local people's economic and food security [6,7]. Under the dynamic relationship of farmers and the environment, landraces are developed with unique traits and specific adaptability, often carrying important natural compounds and bioactive molecules, all significant in enhancing food nutritional value [8–11]. The global biodiversity system is interconnected with agrobiodiversity, and its conservation is important for food production as well as for human development efforts [12].

One of the consequences of agricultural intensification is an increase in crop uniformity and hence the significantly decreased abundance and diversity of plant genetic resources for agriculture on many levels (number of landraces, reduction in landrace cultivated areas, loss of crop wild relatives). Moreover, this uniformity has diminished crop adaptability to ecological changes [13] and reduced the genetic base of several crops like sorghum and vegetables or maize [14,15]. This genetic erosion could jeopardize the functionality of agro-ecosystems, plant breeding programs, and efforts for food security and social equity and could limit traditional plant knowledge and utilization [16]. Landraces, due to their adaptability to specific local and often harsh environmental conditions and their large genetic variability, can provide resistance to biotic and abiotic stresses [17,18]. In search of neglected agricultural species and populations, of particular interest are locations of exceptional agrobiodiversity where, over many generations, farming practices, in interaction with abiotic and biotic conditions created hotspots of diversity combined with the interaction with both abiotic and biotic conditions, have created hotspots of diversity [19]. On the other hand, genetic erosion is rapidly advancing [20], particularly in the developed world, including many European regions. One of the main means of resistance is the high number of gene banks [21]. Yet, a global estimate of the number of existing landraces is missing, and only a few national institutes have established an exhaustive inventory [17].

Monitoring and documenting the status of plant genetic resources in isolated areas can contribute to the establishment of national and international inventories and thus to the reduction of diversity loss and saving not only of landraces but also of local knowledge and cultural identity [8,22]. Previous expeditions by our laboratory staff as well as by other institutions [23–27] have shown that even at the beginning of the third Millennium, a significant wealth of landraces have been retained, although genetic erosion is continuing [16]. Hence, a question arises regarding the current condition of landraces' diversity and the extent of genetic erosion in continental areas [27]. In an exploration in Arcadia, a mountainous area in central Peloponnese, it was found that while landraces are still being cultivated, genetic erosion is advancing, especially in cereals and pulses [28]. Thus, a hypothesis can be formulated concerning whether this is a general pattern for hilly, semi-mountainous and mountainous areas by adding more data from such areas. This is achieved by visiting a large number of villages, aiming to collect historical information and landrace seeds and to investigate whether this pattern also applies to semi-mountainous areas. The area of Messinia was chosen, as it is located in the Southwest Peloponnese, next to Arcadia. It is characterized by similar geographical patterns (e.g., sea level and mountainous inland villages) and small-size farms, thus potentially having a rich gene pool. The aim of this detailed survey was to identify the remaining wealth of landraces and their degree of genetic erosion, to examine whether there are neglected landraces and under-utilized crops in the area as well as to document the current conservation status of local perennial varieties.

1.1. Natural Conditions of Messinia

1.1.1. Geography and Climate

The region of Messinia covers a large part of Southwest Peloponnese and is characterized by a diverse topography (Figure 1). Mt. Taygetos, the largest mountain range of Peloponnese with peaks of over 2000 m (Prophet Ilias 2407 m, Neraidovouna 2025 m), is located in the east side of Messinia, while the region's northern border with Ilia (neighbouring prefecture) is formed by the river Neda. There are two bays, one in the south (Messinian Bay) and the other in the west (Kyparissiakos Bay). Both are encompassed by multiple peaks, eventually forming a large and fertile valley in the center of the region that is rich in surface and subterranean water. The area is characterized by a temperate climate with mild winters and prolonged, dry summers. The average annual air temperature fluctuates between 13 °C and 19 °C, while the annual precipitation ranges from 800 mm to 1500 mm, with lower precipitation in the valley and higher precipitation in the mountains [29].

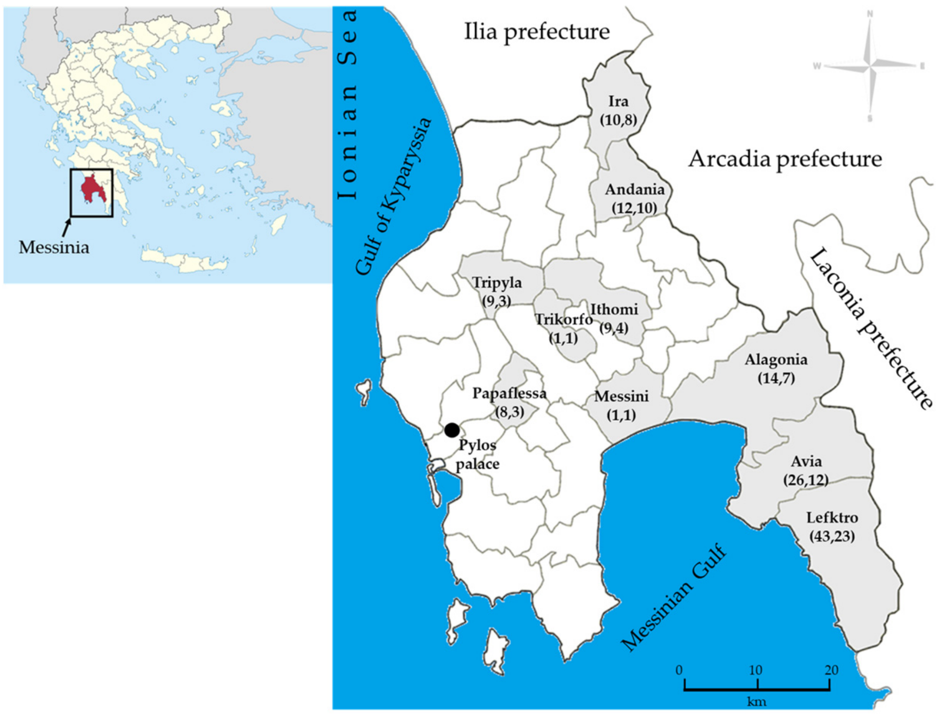

Figure 1. Villages visited in former Municipalities of Messinia (Alagonia, Andania, Avia, Ira, Ithomi, Lefktro, Papaflessa, Tripyla), the Municipality of Messini and the village Trikorfo during collecting missions of the AUA. The figure shows the number of sites where an interview took place (first number in parenthesis) and the number of villages where samples were collected (second number in parenthesis).

From an ecological perspective, Messinia holds particular interest due to its geologic history and geographic position [30]. Due to its geological past characterized by continuous fluctuations in the geomorphological characteristics and surface of the entire area, the right conditions were formed for large flora populations of diverse morphologies and ecological demands to be hosted [31]. Moreover, its position on the edge of the southeast European peninsula acted as a border in the expansion of many plants and as a shelter for many species during the Ice Age [30].

1.1.2. Agricultural History

Indications of land preparation for cultivation have been found in Messinia from 2000 BCE [32]. Since its antiquity, the Messinian land has produced a wide range of local agricultural products. Archaeological evidence shows that agriculture practices were applied during the 13th century BCE, and pottery repositories were used to store oil and wine [33,34]. During the Mycenaean period (ca. 1600–1100 BCE), olive trees were grown in large areas and olive oil was exported (ibid.).

At the palace of Nestor (Pylos Palace) excavated by archeologists during the 1950s [33] (Figure 1), certain rooms were found which were used for olive oil storage [35]. On engraved clay tablets found in the palace, several agricultural crops and products are mentioned [34,36], both as symbols and words (Table 1) in the Linear B script; an early written form of the Greek language [37]. It is worth noting that the names of some crops in 1405–1100 BCE are the same or very similar with those used today, [e.g., "sito" (wheat) then vs. "sitos" or "sitari" now, and "sasama" (sesame), a Semitic loan word [38], then vs. "sousami" today], emphasizing the continuity and long history of their cultivation in the area [38].

Table 1. Agricultural crops and products according to Linear B in Mycenaean Greek (1405–1100 BCE) based on clay tablets found at different sites including Pylos Palace in Messinia.

Agricultural Crop or Product	Linear B		Spelling
	Symbol [a]	Word [b]	
Wheat		𐀯𐀵	si-to
Flour		𐀕𐀩𐀄𐀫	me-re-u-ro
Bread		𐀀𐀵	a-to
Barley		𐀑𐀪𐀲	ki-ri-ta
Flax		𐁁𐀑𐀆𐀊	a3-ki-de-ja
Sesame		𐀭𐀭𐀔	sa-sa-ma
Olive tree		𐀁𐀨𐀷	e-ra-wa
Olive oil		𐀁𐁉𐀺 	e-rai-wo or
		𐀁𐀨𐀺	e-ra-wo
Vines		𐀸𐀋𐀸	we-je-we
Grape must		𐀆𐀩𐀄𐀒	de-re-u-ko
Wine			
Fig tree		𐀱𐀼	su-za
Fig		𐀱𐀒	su-ko

[a] From Wikimedia Commons: https://en.wikipedia.org/wiki/Linear_B_Ideograms (accessed on 15 November 2023). [b] The words and their spelling are based on https://linear-b.kinezika.com/lexicon.html (accessed on 15 November 2023), and reference [38].

Another significant trading activity involved the production of fragrances based on olive oil, infused with coriander, rose, sage, and cyperus (nutsedges) [39], as it can be recognized in Homer's Odyssey quote at the beginning of the present article. Also, at royal ceremonies, offers were made to gods including products like grounded wheat, barley, cyperus, olives, olive oil, wine, and flaxseed, indicating the abundance of agricultural goods that were available at the time in the area [36].

The following centuries, at least from the 7th to 4th BCE after the end of the Mycenaean period, the fertile Messinian lands were a major reason for wars, raids, and expulsion of local populations, with different cities, mainly Spartans, taking control of the area and the agricultural production [40].

During the Ottoman (1461–1715) period, records from a group of Messinian villages based on the Ottoman Archives offer an insight on crop cultivation, which includes well-known cereals and others (rye and millet), pulses, cotton, vegetables, and grapevines (Table 2). The systematic cultivation of flax in the many villages of the area is impressive [41]. Those records also show the introduction of cotton cultivation in Greece as far back as 1506 instead of 1662 [42].

Towards the end of the 16th century, the town of Koroni was the main trading center for the Venetians in the Peloponnese, and among others, olive oil and silk were exported, while the town of Methoni exported wine [43].

According to Alcock [44], before the Greek revolution (1821 CE) in the village of Hasanaga, wheat, barley, rice, lemons, other fruits, and cotton were grown, while olive mills were also present. During the aforementioned revolution, Ibrahim Pasha of Egypt destroyed a large part of the cultivated land, including olive groves, vineyards, and fig trees [45], causing the erosion of genetic diversity of many landraces. After the formation of the newly sovereign Greek state (1834), Kalamata was among the primary trading and industrial Greek cities, and the majority of the population continued to be occupied with agriculture [46]. Bory de Saint-Vincent [47] mentioned agricultural species like oat, beans, peas, vegetables (tomato, okra, potato), fruit trees (almond, apple, pear, citrus, pomegranate), tobacco, flax, and Levant cotton. The recent history of the region is linked with the development of the area and particularly the city of Kalamata and its promotion to the governing, trade, and economic center of Messinia. According to Gardikis [48], a variety of agricultural products (cereals, cotton, tobacco, sesame, raisins, fruits, vegetables, etc.) were cultivated in Messinia, and the total agricultural area covered 62,461.3 ha in 1930 (Table 3). Grapevines (33,600 ha) covered most of the cultivated land, followed by cereals (33,580 ha) and olive trees (16,150 ha), while the crop with the highest production was grapevines (77,000 t), mainly for the production of wine and raisins. This supports the appearance of small factories in the second half of the 19th century, which processed local agricultural products (silk, wine, soap, olives, etc.).

Table 2. Crop cultivation or production in villages of the Soulimochoria area of Messinia in different census years during the Ottoman period. Data extracted from [41] based on the Ottoman Archives in Istanbul.

			Tax (Value in Akçe [1])		Crop Cultivation or Production (Expressed as Akçe Value)												
Village	**Year of Census**	**Number of Families**	**Ispence [2]**	**Korukuluk [3]**	**Cereals**	**Wheat**	**Barley**	**Rye**	**Millet**	**Cowpea**	**Chickpea**	**Vegetables**	**Fodder Crops (Vetch)**	**Flax**	**Cotton**	**Must**	**Wine**
Psari	1461	4	80			100	15										
	1514	22	638	88	✓ [4]	✓				✓	✓	✓		✓		15	59
	1569	50	1500														
	1571	74	2050			940	✓					✓				✓	✓
	1583	70	2225			1950				✓			✓				✓
	1715	47	1175			5970							1740		1100		
Souli	1514	3	75			✓	✓			✓			✓	✓	✓		✓
	1569		200	32		507	90				39	16	12	32	24	14	96
	1571/2	11	300	44		975	480				130	22	200	44	225	34	340
	1583	10	375			480	480				10	20	200	40	300		300
Vlaka	1506	17	600			1969	725		✓	✓		✓	✓	✓	✓		✓
Kleisoura and Porta	1506	7 + 4				✓	✓					✓		✓	✓		✓
Katsoura	1506	9				✓	✓	✓				✓	✓	✓			✓
Yorgi	1571					✓	✓		✓								
Ripesi	1506	21	550			✓	✓		✓			✓	✓	✓	✓		✓
	1569	20				✓	✓										
Liopesi	1514	8				✓	✓					✓	✓	✓			✓
	1569	2			✓	✓	✓										

[1] A silver coin, which was the chief monetary unit of the Ottoman Empire; [2] tax which combines the cultivated area, soil quality, and the economic situation of the taxed person; [3] tax for olive groves, fruit trees, fields, forest protection; [4] ✓ indicates that there is a report of the related species during the specific year of census.

Table 3. Total cultivated land and production of the main crops in Messinia in 1930 and 1940 (adapted from Gardikis [48] and Aivaliotakis [49]).

Cultivated Crop	**1930 [48]**		**1940 [49]**			
			Semi-Mountainous [1]		**Lowland [2]**	
	Area (ha)	**Production (t)**	**Area (ha)**	**Production (t)**	**Area (ha)**	**Production (t)**
Wheat	14,200	6000	5070	3263	812	600
Barley	2400	950	348	322	93	84
Mixture (wheat–barley)	5100	2300	1305	960	63	51
Maize	7200	6500	9235	942	-	-
Oat	4350	2200	1047	862	200	147
Rice	180	73	-	-	156	596
Rye	150	50	38	27	-	-
Total cereals [3]	**33,580**	**18,073**	**17,043**	**6376**	**1324**	**1478**
Beans	-	-	-	-	106	538
Maize–beans	-	-	-	-	731	1133
Chickpeas	-	-	47	31	-	-
Lentils	-	-	724	488	2.8	1
Peanuts	-	-	-	-	65	152
Total legumes	**1100**	**600**	**771**	**519**	**904.8**	**1824**
Lupins	-	-	251	196	73	49
Vetch	-	-	475	143	186	295
Total fodder crops	**260**	**1700**	**726**	**339**	**259**	**344**
Tomato	-	-	-	-	182	3121
Melon	-	-			128	1878
Others	1030	6400	-	-	-	-
Potato	830	7500	109	-	526	7438
Total vegetables	**1860**	**13,900**	**109**		**836**	**12,437**
Flax seed	-	-	45	-	0.6	-
Cotton	0.3	2.1	-	-	405	381
Sesame	33	20	22	-	11	11
Total other crops	**33.3**	**22.1**	**67**		**416.6**	**392**
Citrus	2100	-	6590	-	540	-
Figs	4000	12,000	47,190	6097	46,400	7179
Olive trees	16,150	8300	51,245	6097	71,450	1802
Fruit and olive trees	**22,250**	**20,300**	**105,025**	**12,194**	**118,390**	**8981**
Wine grapes	11,050	32,000	1616	-	2404	-
Table grapes	50	-	-	-	-	-
Raisin grapes	22,500	45,000	1790	-	4472	-
Grapevines	**33,600**	**77,000**	**3406**	**-**	**6876**	-
General total	62,461.3	131,595.1	127,147	19,428	129,006.54	25,456

[1] Semi-mountainous basins of Agios Floros, Amphita, Dourakos, Lygdiou of Pyrnakos, Tsakona, Xarathrou, Xerila Ariou. [2] Lowland areas of Kalamata and Messini. [3] Bold numbers indicate the total of each crop group.

Prior to the agricultural intensification of the region in the 1960s, crop rotation and irrigation rotation systems were used. The most prevalent system sequence included rotations (cereal–legume, cereal–fallow) and organic fertilization (manure, compost). Ploughing was limited to late-maturation crops (corn, beans), while for crops such as chickpeas and lupins, harvesting was done by hand [50]. Significant differences were observed in the type of crops that were being cultivated between the lowland and mountainous regions of Messinia. In the mid-20th century, cereals (wheat, barley, rye, and oat) covered large areas in the mountainous regions (Table 3).

Monoculture maize was the most prominent crop in mountainous areas covering a total area of 9235 ha in 1942 [49]. On the contrary, in the lowlands, an intercropping system of maize–beans was applied in relatively high numbers (1133 t, 731 ha), while many fruits and vegetables were also grown [49]. In the decade of 1930, vine cultivation was dominant, with 33,600 ha, of which two thirds were used for black currant production, followed by olive trees (16,150 ha) and fig trees (4000 ha) (Table 3). Fruit trees were cultivated in large acreages both in mountainous and lowland regions, including pears, apples, peaches, walnuts, hazelnuts, and plums, with citrus trees (lemons, oranges) being the most widespread in both low and high altitudes [49]. Furthermore, the cultivation of mulberries was significant for the production of the renowned silk textiles that formed an important exported product in the 18th and 19th centuries [50,51]. Another important crop for the region is fig trees. Figs, also known as "Askadia", were grown widespread and consumed in the Messinian region. These figs were dehydrated and are mainly known for their drying process [52].

Agriculture in the 20th century was dominated by olive tree cultivation, driving a substantial part of the region to monocropping and thus marginalizing other fundamental crops such as cereals, legumes, vegetables, grapes, and nut trees. Nonetheless, many of these landraces continued to be grown and preserved in the mountainous isolated areas of Messinia, forming utilitarian self-sufficient economies that traded a limited number of selected agricultural goods [50].

1.1.3. Current State of Agriculture in Messinia

Today, olive trees are dominating the agricultural land of Messinia, with the total production of olive oil in 2018 reaching 423,353 t. Other prominent crops include citrus fruits and cereals, with their harvesting products reaching 7662 t and 2821 t, respectively, in 2018 [53]. Moreover, the production of figs is significant. Until 2005, Greece was a major fig producer, along with Spain and Turkey, with Messinia being the main region in Greece, producing more than half of the total production [54]. Today, the export volume of figs has decreased because of reduced production [54]. The production of black currants (raisins), especially the ones produced by the grape cultivar "Korinthiaki staphis" or "Korinthiaki stafida" (Corinthian raisin), is also of significant importance. Its dietary and nutritional benefits for human health due to the high levels of antioxidant properties found in all its biotypes cultivated in the Greek vineyard at a grape and berry level [55] as well as at a currant level [56], hint at its significance, despite the decrease in its cultivated surface area. The surface area cultivated with Corinthian raisins was 2516 ha in 2012. However, raisin production in Greece and subsequently its exports have significantly decreased compared to the 19th century (75% of total exported goods).

2. Materials, Methods, and Information Sources

2.1. Literature Information from Previous Missions or Databases

Information and data regarding cultivated plant genetic material from Messinia were collected from various sources, such as:

1. Published articles, grey literature (old publications and monographs about the region and certain crops like wheat and common bean), and bibliographic references that refer to the agricultural history and biodiversity of the Messinian region. These sources include:
    - Several research studies by the Institute of Plant Breeding and monographs about cereal crops cultivated in Greece published by the Ministry of Agriculture [57–59];
    - An Archive of Agricultural Economic Studies by the Agricultural Bank of Greece published in 1942 [49];
    - A book published by the Fodder Crops and Pastures Institute of Larisa regarding common bean local varieties in Greece in 1960 [60].
2. Information regarding landraces was obtained from plant genetic databases and past collecting expeditions. The digital database EURISCO (2023) [61] and the online platform of global Plant Genetic Resources for Food and Agriculture Genesys 2023 [62] were searched to find germplasm accessions from Messinia that are stored in various gene banks.
3. More vital information was derived from reports on past expeditions during the 20th century in Messinia for sample collection of cultivated species such as cereals, vegetables, industrial and forage crops, and perennial fruit trees.

4. The genetic material collection missions are reported below chronologically.
    - Kaiser-Wilhelm-Institut für Kulturpflanzenforschung (KWIK) (1942): a large part of this collection has been conserved in the Gene Bank of the Leibniz Institute of Plant Genetics and Crop Plant Research (IPK) [63,64];
    - Fodder Crops and Pastures Institute (FCPI) (1982/1983) [65];
    - Plant Breeding and Acclimatization Institute (PBAI) (1999) [62];
    - Greek Gene Bank (GGB) in 2006 [66].

Additional information regarding grapevine varieties in Messinia was obtained from ampelographic carried out by Greek research institutions [67–71].

2.2. Collecting Expeditions

Before the expeditions, permission for the collection of plant germplasms was obtained from the Ministry of Rural Development and Food. In total, 11 separate collection missions were carried out by the Agricultural University of Athens (AUA) during the period of 2013–2016 with the aim of covering a substantial part of the Messinian region (Figure 1). During these expeditions, 133 villages and communities were visited in the former municipalities of Alagonia, Andania, Avia, Ira, Ithomi, Lefktro, Papaflessa, Tripyla, and the municipality of Messini and the village Trikorfo (Figure 1).

2.3. Structure of Interviews and Sample Collection Approach

The collection of information and germplasms was achieved through communication with farmers and other local inhabitants in the form of semi-structured questionnaires/interviews. The questionnaires included questions about the annual or biennial and perennial landraces cultivated by the interviewee or by her/his parents. With the permission of each interviewee, we asked:

- Her/his age;
- Employment status (farmer, civil servant, agronomist, etc.);
- If her/his parents cultivated cereals, vegetables, legumes, etc.;
- The village where she/he was born;
- The village where she/he lives;
- If she/he understands the difference between cultivars and landraces;
- If she/he remembers any of the landraces she/he or her/his parents cultivated;
- If she/he still cultivates any landrace, as well as the name and basic morphological traits of the landrace and its use.

Each interview lasted about two hours. Useful information was collected regarding the cultivation and conservation of landraces such as cereals, legumes, vegetables, fruit and nut trees, and grapevine local varieties. To eliminate the possibility of biased answers, the interviewees were asked to name (if they knew) any landraces. If they did not know or remembered any, they were asked to name the type of crop species (cereal, legume, vegetable, fruit or nut tree, and grapevine landraces/local varieties) associated with the landraces that appeared in the literature. The investigation of the introduction history of each crop and landrace was challenging, as the time of introduction typically exceeded the life span of the interviewee. Thus, the grey literature could provide answers to this question.

During and after the interview, the interviewees were asked if they possessed or had confirmed the existence of seeds (or any other type of genetic material, e.g., bulbs) of the landrace/local variety they mentioned and whether they wanted to donate a sample for conservation in the AUA collection. The number of samples donated ranged from 1 to 17. Finally, the interviewees were asked to locate new contacts for purposeful and snowball sampling.

The seed donors were encouraged to provide an adequate quantity of seeds to be representative of the variation. Special care was taken to distinguish whether the sampled seeds were landraces or old introduced commercial cultivars. This was achieved using the following methods:

- Asking how he/she (the seed donor) obtained the seeds (e.g., if the seeds were previously conserved by the donors' ancestors, as this is a good indication that the samples constitute landraces;
- Asking whether the crop is marketed (e.g., neglected/underutilized species that have not been available as registered commercial cultivars are more likely to be landraces);
- Visiting the cultivated field or garden where the morphological variability can be examined in order to distinguish more variable landraces from uniform cultivars, especially hybrids;
- Sowing and examining the collected seeds in AUA fields.

The method of sample collection based on interviews aimed at covering all the villages of a municipality, thus increasing the possibility of collecting landrace diversity.

The expeditions of the Greek Gene Bank, having less time and resources, covered fewer villages (compare Table 4 with Table 5). The botanical classification of each sample was performed by the agronomist who was conducting the interview. In the few cases in which the species was rare or possibly unknown, taxonomic keys were used. Most of the collected samples were mature seeds. Afterwards, each sample was given a unique number, and the related data were registered in an excel file sorted by donor, crop group (e.g., cereal, pulses), and geographical coordinates. The samples were divided in two parts. One part was sent for conservation in the Greek Gene Bank, while the other part was stored in a refrigerator at the Plant Breeding and Biometry Laboratory of the AUA.

Table 4. Landraces and crop wild relatives' accessions collected in Messinia in previous exploratory missions.

Species	Common Name	KWIZ [1] (1942) [64]	FPCI [2] (1983) [65]	PBAI [3] (1999) [62]	GGB [4] (2006) [66]	EURISCO [5] [61]
Avena byzantina	Oat	8 [6]				
Avena spp. [7]	Wild oat relatives	2				
Hordeum vulgare	Barley	23				
Aegilops spp. [8]	Wild wheat relatives					24 (1984) [9]
Haynaldia villosa L. Schur	Wild wheat relative					2 (1984)
Triticum aestivum L.	Common wheat	9				
Triticum durum Desf.	Durum wheat	2				
Triticum turgidum		4				
Zea mays	Maize	2			5	5
Total cereals [10]		**50**			**5**	**31**
Astragalus hamosus					1	
Cicer arientinum	Chickpea					4 (1983)
Lathyrus ochrus (L.) DC.	Cyprus vetch	3	1			1 (1983)
Lens culinaris	Lentils	6				1 (1983)
Lupinus albus L.	White lupin	4	2		1	4 (1980–83)
Phaseolus vulgaris	Common bean	15			1	1 (1983)
Pisum sativum	Common pea	12				9
Vicia faba var. faba	Fava bean	2	1		3	5 (1983)
Vicia faba var. minor	Field bean	2				1 (1983)
Vicia sativa	Common vetch	3	1			1 (1983)
Vicia ervilia	Bitter vetch	1	1			
Vigna unguiculata	Cowpea				1	
Trifolium spp.	Clover				5	
Total legumes		**48**	**6**		**12**	**27**
Abelmoschus esculentus (L.) Moench	Okra				2	
Allium sativum	Garlic				2	

Table 4. *Cont.*

Species	Common Name	KWIZ [1] (1942) [64]	FPCI [2] (1983) [65]	PBAI [3] (1999) [62]	GGB [4] (2006) [66]	EURISCO [5] [61]
Beta maritima	Sea beet (wild beet relative)					3 (1981)
Beta vulgaris	Beet					7 (1981)
Capsicum annum	Pepper				1	
Cucumis sativus	Cucumber	2			1	
Cucumis melo					1	
Curcubita maxima					1	
Curcubita moshata					2	
Curcubita pepo					1	
Daucus carota	Wild carrot			1		
Lycopersicon esculentum	Tomato			1	8	
Raphanus sativus L.	Radish	1				
Solanum melongena L.					1	
Total vegetables		**3**		**2**	**20**	**10**
Daucus bicolor	Carrot			1		
Lagenaria siceraria					1	
Linum usitatissimum	Common flax	3				
Vitis vinifera	Grapevine					9 (1983)
Total other		**3**		**1**	**1**	**9**
Total landraces		**104**	**6**	**3**	**38**	**77**

[1] KWIZ = Kaiser-Wilhelm-Institut für Züchtungsforschung (breeding research), now Leibniz Institute of Plant Genetics and Crop Plant Research (IPK), Gatersleben; [2] FPCI = Fodder Crops and Pastures Institute; [3] PBAI = Plant Breeding and Acclimatization Institute, Radzikow, Poland; [4] GGB = Greek Gene Bank; [5] EURISCO: European Search Catalogue for Plant Genetic Resources (sourced by: http://www.eurisco.ecpgr.org, accessed on 15 November 2023); [6] Accession number; [7] *Avena barbata*, *A. sterilis*; [8] *Aegilops lorentii*. *Ae. caudata*, *Ae. comosa*, *Ae. triuncialis*, *Ae. Ovata*; [9] Year of collection. [10] Bold numbers indicate the total of each crop group.

Table 5. Number of villages/settlements visited and landrace samples collected per municipality and crop group.

Municipality	Visited Villages/Settlements	Villages in Which Seeds Were Offered	Samples				
			Cereals	Pulses	Vegetables	Other	Total
Alagonia	14	7	6	6	21	1	34
Andania	12	10	3	26	35	4	68
Avia	26	12	2	26	48	11	87
Ira	10	8	5	13	20	3	41
Ithomi	9	4	3	13	17	3	36
Lefktro	43	23	3	44	88	2	137
Papaflessa	8	3		3	4	1	8
Tripyla	9	3	1		6		7
Messini	1	1		1			1
Trikorfo	1	1	3				3
Extra samples *			2	2	1		5
Total	**133**	**72**	**28**	**134**	**240**	**25**	**427**

* Samples donated from Messinia without a specific origin.

Since the first expedition and even after the last one, many of the local residents have sent more landrace samples (mostly seeds) to the collection of the AUA. These samples were also included in the present study.

The environmental conditions of the cultivation areas depended on the microclimate of the area and the soil texture. More specifically, the lowlands were more fertile than the highlands where soil erosion occurred due to the inclined slopes. Precipitation is higher in the mountainous areas compared to the lowlands. Cultivations conditions can be distinguished in two categories: professional agriculture where mechanical infrastructure is used, mainly in lowlands, and amateur gardeners who cultivate their gardens using light machinery and manpower.

3. Results

3.1. Databases and Exploratory Mission Collections

Due to the geographic and ecological characteristics of Peloponnese, numerous plant genetic material collecting expeditions have taken place in the past, including Messinia. The Kaiser-Wilhelm-Institut für Kulturpflanzenforschung (KWIZ), today the Leibniz Institute of Plant Genetics and Crop Plant Research (IPK), collected 104 accessions in 1942 from Messinia during the German occupation of Greece [63,64]. More specifically, the accessions that were collected consisted of 23 accessions of barley, 15 accessions of common beans, and 12 accessions of peas. Lupins, broad beans, and flax seed were also collected (Table 4).

The Polish Genebank in Radzikow also holds accessions of carrots, wild carrots, and tomatoes from Messinia [62] and several other gene banks around the world such as the GRIN-USDA conserve ex situ Messinian germplasm samples. However, most of them hold donations from IPK; therefore, these accessions are not recorded in this paper to avoid duplication. The Fodder Crops and Pastures Institute (Larissa, Thessaly) collected germplasm samples from expeditions that took place in 1983 [65] and were funded by the International Board for Plant Genetic Resource (IBPGR) [66]. During these missions, cultivated legumes were exclusively collected, some of which were rare, like white lupin, Cyprus vetch, and bitter vetch (Table 4). Some of the above-mentioned germplasm materials are currently located in Spain, Greece, Germany, and Poland and can be found in the database of EURISCO (Table 4). The most recent expedition took place in 2006 by the Greek Gene Bank when 38 accessions were collected, of which 32 were landraces; mainly vegetables (Table 4) [66]. The expeditions of the Greek Gene Bank, having less time and resources, covered fewer villages (Comparison of Tables 4 and 5).

3.2. Agricultural University of Athens (AUA) Exploratory Mission for Landraces

3.2.1. Annual and Biennial Species

In total, 133 villages/settlements were visited during 10 expeditions from 2013 to 2015, covering a range of altitudes from sea level up to 1100 m, with more than 50% of the villages being located at 400 m (a.s.l.) or higher. During the expeditions, 223 semi-structured interviews were carried out and 427 samples, mostly of annual crop species (Table 5), were offered by 112 donors. Important information was also collected through interviews with local residents concerning old landraces and perennial species. Of the collected samples, more than the half were vegetables, followed by pulses (Table 5), with an even distribution between municipalities for widely cultivated species like maize, cowpea, common beans, tomato, and pumpkin, whereas samples of rye, peas, and lentils were rare and unevenly distributed (Table 6).

Regarding the spatial distribution between the municipalities, most of the samples were recorded in the municipality of Lefktro due to the high number of villages visited and the relatively plain terrain. Another municipality with a significant number of vegetable and pulse samples was Andania, an area with a mountainous terrain and lower touristic development than the other (coastal) municipalities.

Table 6. Crops samples collected during the AUA exploratory expedition in Messinia.

Genus	Species	Common Name	Municipality	Total Number of Samples
Avena	*sativa*	Oat	Alagonia (1) [1]	1
Secale	*cereale*	Rye	Lefktro (1)	1
Triticum	*polonicum*	Polish wheat	Messini (1)	1
Triticum	spp.	Wheat	Alagonia (5), Messini (2)	9 [2]
Zea	*mays*	Corn, maize	Andania (3), Avia (2), Ira (5), Ithomi (3), Lefktro (2), Tripyla (1)	16
Total cereals [3]				**28**
Cicer	*arietinum*	Chickpea	Avia (1), Ira (1), Lefktro (1)	4 [2]
Lablab	*purpureus*	Lablab or hyacinth bean	Andania (6)	6
Lens	*culinaris*	Lentils	Avia (1)	1
Lupinus	*albus*	Lupin	Avia (3), Ithomi (1), Lefktro (7)	12 [2]
Phaseolus	*vulgaris*	Faba bean	Alagonia (5), Andania (11), Avia (20), Ira (7), Ithomi (6), Lefktro (15)	64
Pisum	*sativum*	Pea	Alagonia (1)	1
Vicia	*faba*	Broad bean	Andania (1), Avia (1), Ira (2), Ithomi (3), Lefktro (20), Papaflessa (1)	28
Vigna	*radiata*		Messini (1)	1
Vigna	*unguiculata*	Cowpea	Andania (8), Ira (3), Ithomi (3), Lefktro (1), Papaflessa (2)	17
Total pulses				**134**
Abelmoschus	*esculentus*	Okra	Andania (5), Avia (1), Ithomi (2), Lefktro (2)	10
Allium	*sativum*	Garlic	Alagonia (1), Andania (4), Avia (4), Ira (1), Ithomi (2), Lefktro (2), Tripyla (1)	16 [2]
Allium	*cepa*	Onion	Alagonia (1), Avia (1)	2
Allium	*ampeloprasum*	Leek	Ira (1)	1
Amaranthus	*blitum*	Purple amaranth	Avia (4), Lefktro (8)	12
Anethum	*graveolens*	Dill	Lefktro (1)	1
Anthriscus	*cerefolium*	Chevril	Andania (1), Avia (3)	4
Apium	*graveolens*	Celery	Avia (2), Lefktro (2)	4
Brassica	*cretica*	-	Andania (1), Ira (1)	2
Brassica	*oleracea* var. *capitata*	Cabbage	Alagonia (6), Andania (1), Avia (1), Ira (2), Lefktro (4)	14
Brassica	*rapa*	Turnip	Avia (1), Lefktro (4)	5
Capsicum	*annuum*	Pepper	Andania (2), Avia (3), Ithomi (2), Lefktro (2)	9
Cichorium	*endivia*	Escarole	Avia (1), Lefktro (1)	2
Cichorium	*intybus*	Dandelion	Lefktro (2)	2
Citrullus	*lanatus*	Watermelon	Andania (1), Lefktro (1)	2
Cucumis	*melo*	Melon	Andania (1), Lefktro (3), Tripyla (2)	6
Cucumis	*melo* var. *flexuosus*	Armenian cucumber	Andania (1)	1
Cucumis	*sativum*	Cucumber	Alagonia (1), Lefktro (1),	2
Curcurbita	sp.	Squash	Alagonia (7), Andania (8), Avia (10), Ira (4), Ithomi (8), Lefktro (24), Papaflessa (3), Tripyla (1)	65
Foeniculum	*vulgare*	Fennel	Avia (2)	2
Helianthus	*annum*	Sunflower	Andania (1), Lefktro (1)	2
Lactuca	*sativa*	Lettuce	Alagonia (1), Avia (3), Ira (1), Lefktro (4)	9
Petroselinum	*crispum*	Parsley	Andania (1), Avia (2), Lefktro (4)	7
Sinapis	sp.	Mustard	Alagonia (1), Avia (1), Lefktro (3)	5
Solanum	*lycopersicum*	Tomato	Alagonia (2), Andania (8), Avia (9), Ira (10), Ithomi (3), Lefktro (14), Papaflessa (1), Tripyla (2)	49

Table 6. *Cont.*

Genus	Species	Common Name	Municipality	Total Number of Samples
Solanum	*melongena*	Eggplant	Lefktro (2)	2
Spinacia	*oleracea*	Spinach	Avia (1), Lefktro (3)	4
Total vegetables				**240**
Calendula	*officinalis*	Common marigold	Avia (2)	2
Ceratonia	*siliqua*	Carob	Avia (1)	1
Heliotropium	sp.	Heliotrope	Avia (1)	1
Juglans	*regia*	Walnut	Avia (2), Ira (1), Papaflessa (1)	4
Lagenaria	*siceraria*	Calabash	Andania (1), Ira (2), Ithomi (3)	6
Linum	*usitatissimum*	Flax	Alagonia (1), Avia (2)	3
Luffa	*aegyptiaca*	Egyptian cucumber	Andania (2)	2
Nicotiana	*tabacum*	Tobacco	Andania (1)	1
Ocimum	*basilicum*	Basil	Avia (1)	1
Origanum	*vulgare*	Oregano	Avia (1)	1
Prunus	*dolcis*	Almond	Lefktro (2)	2
Viola	sp.	Violet	Avia (1)	1
Total other crops				**25**
Total samples				**427**

[1] Numbers within parentheses indicate the number of landrace samples collected from each village. [2] Indicates that there was an extra sample donated without village location reference. [3] Bold numbers indicate the total of each crop group.

Cereals

One well-known wheat accession in Greece, named "Mavragani", was donated by a farmer in the municipality of Ithomi and was reported by interviewees in most of the visited villages. However, after cultivation in AUA fields and analysis, it was found to be a mixture including *Triticum polonicum* (Figure 2). The farmer who donated the seeds informed us that he had received them from his mother, who had visited a Monastery in Ilia (neighboring prefecture to Messinia) in 1965 and brought a few seeds back to the village [72]. This specific sample proved to be a mixture of *T. polonicum*, *T. durum*, and *T. aestivum* (Figure 3) consisting of 88.6%, 8%, and 3.4% spikes, respectively, and having 83%, 15.3%, and 1.7 of the total seed weight, respectively.

Figure 2. Spikes of *Triticum polonicum* in black circles from Messinia cultivated in AUA fields (2019) (Photo by Ricos Thanopoulos).

Figure 3. Spikes of "Mavragani" mixture: and *Triticum polonicum* spike, front (**a**) and back (**b**) view respectively, (**c**). *T. durum* spike and (**d**). *T. aestivum* spike (Photo by Ricos Thanopoulos).

According to the donor, his family had cultivated these seeds until they produced a reasonable quantity to make bread. He stated that the bread was tasty and contained a significant amount of semolina flour [72]. An interesting mixture mentioned by the interviewees was of wheat and barley (*Hordeum vulgare*), known locally as "Smigadi". They distinguished the "Smigadi" into two categories, the "Chondrosmigadi" (thick mixture) with thick wheat seeds and the "Lianismigado" (thin mixture) with thin wheat seeds. The local residents referred to two barley landraces. One, which is named "Krithari" (meaning barley), is the common barley which is sown in autumn. The other is named "Martitsa or Martaki", indicating the time of sowing (March) in colder, usually mountainous areas. It has a short biological cycle and is used for bread and for animal feed. However, no barley samples were collected; another indication of genetic erosion. Oats (*Avena sativa*) were also widely reported by the interviewees, who mentioned their use as fodder and their cultivation in infertile soils. One oat sample (Table 7) was collected in the municipality of Alagonia. Similarly, one rye (*Secale cereale*) sample was collected in the municipality of Lefktro (without a specific local name). Multiple samples (16) of maize (*Zea mays*) were collected in six municipalities. In Messinia, maize is cultivated in gardens; thus, it can still be found. Most local names of maize landraces refer to the kernel's color, such as "Kokkinos" (red), "Kitrinos" (yellow), and "Aspros" (white). Another variety named "Xerikos" (dry) was reported in interviews referring to non-irrigated varieties. Similarly, the landrace "Koukla" has taken its name from the beautiful ear, according to the interviewees. According to the interviewees, maize was often used to make a type of bread called "Bobota" in the past when wheat flour was scarce and expensive.

Pulses

The results regarding the agrobiodiversity of legumes in Messinia were promising. A high number of 134 samples was collected during the missions. The main reasons for their in situ conservation are (a) the easiness of storing seeds, (b) their cultivation in home gardens, and (c) their use in the local cuisine. A total of 64 samples of common beans (*Phaseolus vulgaris*) and 28 samples of broad beans (*Vicia faba*) were collected (Table 6). Throughout our conversations with the local residents, "Tsaoulia" and "Barbounia" were the most frequently mentioned landraces. During eleven exploratory expeditions organized by the AUA, a large number of broad bean (*Vicia faba*) samples were collected (Table 6). The interviewees reported many names, including "Blezes", "Plagoumari", "Psilokouki" (small broad bean), "Lianokouki" (small broad bean), "Mavrokouki" (black broad bean), "Mikrokouki" (small bread bean), "Fagokoukia" (broad bean for eating), and "Platokouki" (wide broad bean). The names "Psilokouki", "Mikrokouki", or "Lianokouki" are used to describe the small size of the seeds that characterize *Vicia faba* var *minor* and traditionally are used in cooking to make a puree known as "fava". The seeds of minor broad beans appeared in two colors, white and black ("Mavrokouki"). The *Vicia faba* var *major* ("Platokouki") is used for oven-baked food and sometimes for making puree.

In our expeditions, 17 cowpea samples were collected from five municipalities and nine villages (Table 5), most often referred to as "Mavromatiko" (black-eyed), while the name "Ampelofasoulo" (grapevine bean) was also reported. The names "Fidofasoulo" (snake bean) or "Pihiariko" (cubit, as a noun), "Pihofasoulo" (cubit bean), and "Katsikantero" (goat intestine) were also recorded for asparagus beans (*Vigna unguiculata var. sesquipedalis*). Landraces of lupin (*Lupinus albus*) can still be found in Messinia, and a total of 12 samples were collected during the AUA missions (Table 6). Most of the lupin samples were collected in the municipality of Lefktro. Lupins were mentioned in almost all of the visited communities, with particular reference to their use as feedstock and less often for human consumption. After a de-bittering process in rivers or the sea, lupins were used mainly for pig nutrition. The local residents claimed that the meat of pigs fed with lupins had a very good texture. As the interviewees said, the main lupin consumption as food was at the end of the carnival fest as snack in water with salt, more rarely as a soup. Sometimes, lupins were ground, and the flour was used for making bread. Lupins have also been used in Messinia as green manure and as physical protection against animal grazing, due to their undesirable taste, in olive groves.

Lablab or hyacinth beans (*Lablab purpureus*), locally known as "Tsikouritsa", were found during our expedition only in some villages in the Ithomi municipality (Figure 4), where six samples were collected. The interviewees reported the cultivation of lablab, one with whitish pods and a fresh color, and a second black one named "vromofasoula" (bad odor bean), due to their bitter taste. Even though only four chickpea (*Cicer arietinum*) samples were collected during the expeditions, the local residents widely referenced this species, indicating its severe genetic erosion. The most frequently mentioned names were "Psilorevithi" (small-grain chickpea) and "Agriorevitho" (wild chickpea), with a dark brown seed color. They were used for human consumption in soups and as nuts snacks (dried seeds named Stragalia).

Figure 4. Detailed image of *Lablab purpureus* plants with whitish–green fresh pods from Messinia showing leaves, legumes (pods), and seeds (photo by Ioulia Drossinou).

The leguminous species mentioned so far were traditionally grown in home gardens, but lentils (*Lens culinaris*) were grown in open plains, often under intercropping systems [49]. This is likely the reason why only one sample of lentil was collected in the municipality of Avia (Table 6), underlying the genetic erosion of the species. Nonetheless, during the interviews, lentils were mentioned by many of the interviewees, with specific references to their size ["Psili" (thin)] and color ["Aspri" (white), "Kafe" (brown)] being made. Similarly, only one sample of pea (*Pisum sativum*) was collected, and its low popularity is also highlighted by the limited references in the discussions with the local residents. The local name, "Kephallonitikos" (from Cephalonia Island) was mentioned while one interviewee said that "peas were grown with olives under intercropping conditions".

Another case of a neglected pulse is that of the mung bean (*Vigna radiata*), known locally as "Rovitsa" or "Psilofasoula" (small beans). This pulse was cultivated by only one farmer, who conserved the landrace and was packaging the seeds for commercial use (Figure 5). The initial seed originated from the farmer's father, who cultivated this landrace since around 1980 [73]. Regarding fodder crops, only vetch was reported, while others such as bitter vetch should be considered lost.

Figure 5. Cultivation of "Rovitsa" (*Vigna radiata*) in Messini. With the inset showing its flowers (photos by Efraim Ksinos).

Vegetables

During the collecting missions, a high number (240 samples) of vegetable crop germplasm was collected, and this proved to be the group with the richest variety of species (Table 6). Like many leguminous species, vegetables have been largely preserved due to local consumption habits and their small requirements in land acreage, as they are grown in home gardens, mainly by elderly people. Our findings show a high morphological diversity of tomato (*Solanum lycopersicum*) landraces in all the municipalities; 49 samples were collected in total (Table 6). The most well-known landrace, "Chondrokatsari" (thick, curly), was cited by most of the interviewees. The interviewees mentioned that this landrace was grown in the area before World War II and is characterized by an early maturation, sweet taste, and fleshy fruit (Figure 6). Currently, "Chondrokatsari" can be found in the local farmers' markets.

Many other tomato varieties, such as the old cultivars "Italiki" and "Atze" (referring to obsolete cultivar Ace) and the "Pastodomata", which is processed to make tomato puree, were mentioned during the interviews. It should be noted that in the municipality of Alagonia, the local residents have shown interest in the commercialization of the local landrace "Chontrokotsari", positively enhancing its in situ conservation.

In addition to tomato, the seeds of squash (*Cucurbita* sp.), okra (*Abelmoschus esculentus*), lettuce (*Lactuca sativa*), cabbage (*Brassica oleracea*), pepper (*Capsicum annuum*), parsley (*Petroselinum crispum*), spinach (*Spinacia oleracea*), celery (*Apium graveolens*), melon (*Cu-

cumis melo), and cucumber (*Cucumis sativus*) were collected. Specifically, 65 squash samples, primarily of the landraces "Treles" (crazy), "Glykia" (sweet), "Makrouli" (long) and "Mpompola", were collected. Radish (*Raphanus sativus*) was mentioned by of the three interviewees in the municipalities of Alagonia and Ithomi. However, germplasm samples of radish was not collected during our expedition, either because its cultivation has been stopped or because it is very rare. Garlic (*Allium sativum*) germplasms were found in all the municipalities that were visited, and 16 samples were collected. Cabbage was also widely collected, with 14 samples. According to local residents, mustard (five samples were collected), apart from its use in cooking, was also used as a cataplasm against muscular pain. Moreover, 12 samples of purple amaranth (*Amaranthus blitum*) germplasms were collected. Specifically, the landraces "Kokkino" (red), "Prasino" (green), and "Sousamovlito" (=sesame amaranth) were reported by the interviewees. Nowadays, amaranth is not cultivated by local farmers, but it grows as a weed on the borders of home gardens and is collected or is foraged in the wild.

Figure 6. Chondrokatsari tomato landrace cultivated in Messinia (Photo by Ioulia Drossinou).

Aromatic, Medicinal, Industrial, and Perennial Plant Species

Several noteworthy herbs and other species samples were collected, such as heliotropes (*Heliotropium* sp.), aromatic and ornamental species like common marigold (*Calendula officinalis*), and the seeds of some trees (Table 6). One accession of tobacco (*Nicotiana tabacum*) was collected in the former municipality of Andania. Flax (*Linum usitatissimum*) seeds were also found on two occasions in the municipality of Avia, and three samples were collected. The interviewees referred widely to its cultivation in many villages, even after the 1950s. Six samples of calabash (*Lagenaria siceraria*) were collected, which is used by the local residents for decorative purposes. In the past, it was also used as a ladle.

3.2.2. Perennial Crop Species

Regarding perennial plants (fruits, nut trees, olive trees, and grapevines), germplasm samples were not collected. However, their reference during the interviews was prevalent, and they all had a strong appearance in home gardens and commercial productions. The information provided by the interviewees offered good insights into their diversity.

Fruit Trees and Nuts

The cultivation of fruit trees in Messinia is widespread. This can be seen based on the significant inter- and intra-species variability, including landraces and cultivars. In total, during all the expeditions, more than 40 different variety names were recorded, with the most significant being orchard species of figs (8 local names) and pears (15 local names). During the expeditions, for figs, apart from the fig landrace "Tsapelosykia", other names recorded on many occasions were "Ampelosyko" (grapevine fig), "Avgosyko" (egg fig), "Mavrosyko" (black fig), "Kokkinosyko" (red fig), "Asprosykia" (white fig), and "Pikrosyko" (bitter fig). Pear varieties were recorded in 113 villages, demonstrating their widespread cultivation in the region. Names such as "Theristapida" (harvest apple), "Avgoustiatika" (August pears), "Kolokythapida" (squash pears), "Kontoules" (dwarf), "Kampanes" (bells), "Mavrapido" (black pear), "Asprapido" (=white pear), "Ampoucha" (explanation not found), and "Krystallia" (crystal) were recorded. Another important crop for Messinia is the lemon tree (*Citrus* × *limon* (L.) Osbeck), which can be found in most home gardens. In the past, it was cultivated in the lowland areas of the region. The interviewees referred to various local names such as Malteziko (from Malta), "Kitrolemono" (citron lemon), and "Chondrolemono" (fat lemon). One worthwhile finding is a seedless variety recorded in the village of Metamorfosi in the municipality of Papaflessa. The orange tree varieties mentioned by the interviewees were mainly "Kini" (common) and "Malteziki" (from Malta), as well as "Artas" (form Arta region), Sangouini" (blood orange), "Yiafas" (from Haifa), and navel oranges. The other recorded citrus fruits were mandarins (*Citrus reticulata*), "Kini" (common), "Frapa" (pomelo, *C. maxima*), "Neratzia" (sour orange), *C. auranticum*, and "Pergamoto" (bergamot orange, *C. bergamia*).

The fruits with scarce references were apricots (*Prunus armeniaca*) under the local names "Kaisi" and "Kina", peaches (*P. persica*), plums (*P. domestica*), apples (*Malus domestica*), and sweet and sour mulberries (*Morus* sp.). Varieties of pomegranate (*Punica granatum*) were also recorded in different villages. Four landraces of cherries (*P. avium*) were recorded: "Karamela", "Lamboudi", "Petrokerasa", and "Agriokerasia". Scattered populations of various nut trees were also recorded during the expeditions. Like many other trees, these are treated both as orchards and home garden trees. Walnuts (*Juglans* sp.), chestnuts (*Castanea* sp.), almonds (*Prunus dulcis*), and mulberries (*Morus* sp.) were discussed among the local residents. In most cases, no specific names were mentioned, but the interviewees referred to the hardness of the endocarp and their size and shape; for example, the large and soft seeded almond known as "Petramygdalo" (stone almond) as well as the small and tasty "Aframygdalo" (fluffy almond).

Olive Tree

The indigenous varieties recorded during the expeditions were "Kalamon" (from the Kalamata region), "Koroneiki" (from the Koroni region), "Mastoidis" (having a breast shape), "Mavrolia Kalamon" (black olive from Kalamata), and "Tragolia" (the olive of billy goat); however, other names were also documented, indicating possible synonyms or other varieties. The popular "Koroneiki", "Batsiki", or "Lianolia" variety was recorded in all the visited municipalities except for Ithomi and Tripyla.

Grapevine

During the expedition across the several villages and municipalities of Messinia, 62 names, including synonyms, of grapevine varieties were recorded (Table 7). Through the comparative study of the information recorded and the ampelographic data of the typical varieties, an attempt is being made for identification. It is noted, however, that a full ampelographic study is necessary to identify, define, and match these varieties, and in some cases, a combination with the use of molecular markers is required. It should be noted that most of the reported varieties are not commercially cultivated but are only found in multi-varietal vineyards or in pergolas around the countryside.

Table 7. Varietal names of grapevines referenced by the interviewees during the AUA expedition, their usage, and their appearance in the literature.

Names of Grape Varieties Referred to by the Interviewees	Use	Krimbas [67,68]	Davidis [69]	Vlachos [70]	Stavrakakis [71]	Stavrakakis et al. [74]
Aitonychi aspro [1]	T [2]	✓ [3]	✓	✓	✓	
Aitonychi mavro [4]	T	✓	✓	✓	✓	
Agiorgitiko	W [5]	✓			✓	
Agoumisto (Agoumasto)	T/W	✓				✓
Ammoskia	W					
Asfaka	W					
Asprostafylo	W					
Asrpoudi/Asprouda	W	✓				✓
Avgoustelidi	W	✓	✓		✓	
Baxevanis	W					
Chimoniatiko	T	✓	✓			✓
Chimoniatiko kokkino [6]	T	✓				✓
Eftakoilo	T	✓	✓			✓
Elia	T					
Eptanychi	T					
Fileri	T/W	✓	✓	✓	✓	✓
Fileri mavro	W	✓	✓		✓	
Fraoula	T	✓	✓	✓	✓	
Geranastasi	W					
Glikerithra	W	✓			✓	
(tou/of) Kapetanaki	W					
Karvouniaris	W	✓				✓
Kerino	T	✓	✓	✓	✓	
Kolliniatiko (syn. Vergiotiko)	W	✓	✓			✓
Korichi (Korithi, Korinthi)	T/W	✓	✓			
Korinthiaki stafida (syn. Mavromata)	R [7]/W	✓	✓	✓	✓	✓
Koutsavitiko	W					
Krasostafylo	W					
Krasoudi	W					
Kritiko (syn. Liatiko)	W	✓				✓
Krok (syn. Sideritis)	T/W					
Livanaki	W					
Mantineia	W					
Mavroudi	W	✓	✓	✓		✓
Mavrostafylo	W					
Melissaki	W					✓
Merkouri	W					✓
Moschato aspro	W	✓	✓	✓	✓	
Moschato mavro (syn. Black of Hamburg)	T/W	✓			✓	✓
Moschofilero	W	✓	✓		✓	
Moschostafylo	W	✓				
Moschoudi	W	✓				
Nikerythra	W					
Nychaki	T	✓				
Platana	W					
Potamissi	W	✓				✓
Provatina	T/W	✓				✓

Table 7. *Cont.*

Names of Grape Varieties Referred to by the Interviewees	Use	Krimbas [67,68]	Davidis [69]	Vlachos [70]	Stavrakakis [71]	Stavrakakis et al. [74]
Razaki (Rozaki)	T	✓	✓	✓	✓	
Roditis	W	✓	✓	✓	✓	
Samiotiko	W					
Savvatiano	W	✓	✓	✓	✓	
Sideritis	T/W	✓	✓	✓	✓	
Skylopnichtis	W	✓	✓			✓
Sokoroditis	W					✓
Soultanina	R/T/W	✓	✓	✓	✓	
Tourkopoula (syn. Trikopoula)	T/W	✓				✓
Vafousa (Vadousa)	W	✓				✓
Varia	W				✓	
Vergiotiko (syn. Kolliniatiko)	W	✓				✓
Voidomatis	W	✓				✓
Vournela	T/W					

[1] aspro: white, [2] T: table grape cultivar, [3] ✓: the names referred to by the interviewees and the names mentioned by the author(s) may match, but this does not necessarily mean that what the author(s) ampelographically described is the same as what the interviewees reported, [4] mavro: black, [5] W: wine grape cultivar, [6] kokkino: red, [7] R: raisin grape cultivar.

4. Discussion

4.1. Cereals

As already mentioned, the cultivation of cereals in Messinia was first recorded during the Mycenaeans period [35]. By the beginning of 20th century, large areas in the region were devoted to cereals (Table 3), with wheat and maize being the most widespread [48].

Particularly, in 1942, wheat and maize were largely grown in mountainous areas, in contrast to the lowlands, where wheat was grown in limited areas (Table 3) [49]. Interestingly, Papadakis [57], in an extensive inventory, referred to 11 landraces in Messinia and the Peloponnese region. In later studies that took place 13 and 30 years later, other researchers found fewer landraces, and in some cases, under different names [49,58,59] (Table 8). The interviewees referred to 15 landraces, some of which were not found in the literature shown in Table 8. However, these differences can be attributed to various events, such as World War II (abandonment of agriculture, migration) or incomplete surveys, rather than solely to genetic erosion. There are also differences within literature: Aivaliotakis [49] and Kokolios [58,59] were mentioned in five and nine landraces, respectively, some of which were not mentioned by Papadakis [57]. Another reason is synonyms; for example, "Chontrositi" is the same as "Asprostaro Peloponnisou" [57]. Moreover, information from past inventories indicates that the area cultivated with wheat landraces was reduced by 50% during the period spanning the 1940s–1960s due to the adoption of high-productivity cultivars (improved varieties) (Table 9).

A significant example is the landraces of Grinias and Mavragani, which were widely grown during the 1950s and 1960s (Table 9).

The landraces shown in Table 8 were replaced by Greek cultivars ("Lemnos", "Eretreia") or foreign ones ("Canberra", "Montana") that were imported [59]. Between 1946 and 1958, the numbers of wheat cultivars also increased from 5 to 12 [58,59]. However, this change was observed mostly in the lowlands [48]. According to Papadakis [57], many of the landraces are mixtures composed of different wheat varieties [75] or morphotypes, while their local names (e.g., "Asprostaro", "Kokkinosporo") are based on their morphological and cultivation characteristics (Table 8). Kokolios [58] analyzed the landrace "Arapiko" and found that it consisted of 31% *T. durum* var. *leucurum*, 13% *T. durum* var. *reichenbachii*, 42% *T. durum* var. *provinciale*, and 14% *T. vulgare* var. *ferrugineum*. Wheat mixtures are still present, like in Uzbekistan, where 30% of the collected samples are mixtures [76], and

Triticum polonicum, discussed below. Despite the extensive cultivation of wheat and other cereals during more than half of the 20th century (Table 9), only 10 wheat samples were collected during our expedition (Table 6). The extensive genetic erosion regarding wheat in the lowlands could likely be attributed to the rapid expansion of olive tree cultivation in Messinia after the 20th century. This situation of reduced collection of wheat accession seems to be a predictable result for Europe due to severe genetic erosion. In the neighboring prefecture of Arcadia (an isolated mountainous area), during 2018–2021, 34 wheat samples were collected [28], whereas in the Basilicata region of Italy, one wheat accession was collected during 2009 and early 2010 [77,78]. In a remote mountainous area of Uzbekistan, 30 wheat landraces were collected from 17 villages [76].

Table 8. Wheat landraces cultivated in Messinia and Peloponnese, as reported in the literature and referred to by local residents during the collecting expeditions (period from 2013 to 2016). The mixtures of varieties are based on Papadakis [57]. The botanical varieties were based on the description in reference [75].

Name of Wheat Landrace	**[57]**			**[49]**	**[58,59]**	**Referred to by the Interviewees**
	Present	**Mixture of Varieties or Synonyms**	**Botanical Variety and Form**			
Arapiko	✓ [1]	Mavragani of Kriti+ Mavragani Arapiko+ Mavragani of Argolida	*T. durum leucomelan* + *T. durum reichenbachii* (a′) [2] + *T. durum reichenbachii* (c′)		✓	
Asprostaro Peloponnissou	✓	.	*T. turgidum salomonis*	✓	✓	✓
Chondrositi/ Chondostaro	✓	Asprostaro of Peloponnese	*T. turgidum salomonis*	✓	✓	✓
Grinias	✓	Grinias + Tsougrias	*T. vulgare erythrospermum*(c′) + *T. vulgare ferrugimeum*	✓	✓	✓
Diminio	✓	Grinias+ Tsougrias + Mavragani of Argolida	*T. vulgare erythrospermum*(c′) + *T. vulgare ferrugimeum* + *T. durum reichenbachii*			✓
Driminitsa	✓	Trimini + Gremmenia+ Mavragani of Argolida + Asprostaro of Peloponnese	*T. durum affine*(c′) + *T. durum affine*(d′) + *T. durum reichenbachii* + *T. turgidum salomonis*			✓
Kokkinosporo Asprostaro Peloponnissou	✓	-	*T. turgidum pseudosalomonis*			
Mavragani Peloponnissou highlands	✓	Mavragani of Vytina	*T. turgidum nigobarbatum*		✓	✓
Mavragani Peloponnissou lowlands		Mavragani of Argolida	*T. durum reichenbachii*		✓	✓
Nteves						✓
Plaka				✓	✓	✓ [3]
Plakoula					✓	✓ [3]
Platina	✓	Asprostaro of Peloponnese+ Mavragani of Argolida				✓
Platitsa						✓
Psilostaro					✓	✓

Table 8. *Cont.*

Name of Wheat Landrace	[57]			[49]	[58,59]	Referred to by the Interviewees
	Present	Mixture of Varieties or Synonyms	Botanical Variety and Form			
Tsougrias (Tsougriani according to the interviewees)		Grinias+ Tsougrias	*T. vulgare erythrospermum*(c′) + *T. vulgare ferrugimeum*	✓		✓
Trimini	✓		*T. durum affine*(c′)			
Zoulitsa	✓	Kizeltzes	*T. vulgare erythrospermum*(c′)			✓
Total landraces	11			5	9	

[1] The symbol (✓) indicates that the name of wheat landrace is referred. [2] Letters in parenthesis indicate the forms of the variety. [3] Referred also as synonyms by interviewees.

Table 9. Area, production, and percentage of total area of wheat landraces, improved varieties, and other cereals cultivated in Messinia (adapted from [58,59]).

Landraces/Crop	Area (ha) per Year			Production (kg/ha) per Year		Percentage of Total Cultivated Area (%) per Year		
	1946	1957	1958	1957	1958	1946	1957	1958
Asprostaro	-	1825	2243	896	850		5.75	6.37
Chondostaro	330							
Grinias	7910	9298	8339	998	1140	24.6	29.31	23.69
Mavragani	930	1000	1000	1024	1100	4.4	3.15	2.84
Plaka		3070	2908	864	965		9.68	8.26
Plakoula	1340					6.5		
Psilostaro	440							
Unknown	700	1270	2080	740	1095	10.8	4.00	5.91
Total landraces	11,650	16,463	16,570	4522	5150	46.3	51.90	47.1
Wheat cultivars	13,110	15,257	18,636	1518	1591	53.7	48.10	52.93
Total wheat	24,760	31,720	35,206					
Total barley	5000							
Total oat	2700							
Total rye	80							

T. polonicum is referred by Papadakis [57] concerning its cultivation in Messinia called "Leventis" (in Greek, meaning a young man able to confront difficulties and dangers). In 1929, Papadakis mentioned that Leventis could also be found in Ilia [57]. Additionally, Kokolios [58] reported that the same landrace was cultivated in Lefkada island and Eastern Crete under the same name.

Papadakis [57] mentioned that Polish wheat does not have interesting agronomic characteristics. Polish wheat samples collected in Messinia were examined for their agro-morphological traits and were found to have one of the latest heading times among the 15 samples of bread and durum wheat [79]. It had a significantly higher kernel weight (80.45 g), seed volume, and seed firmness compared to the other studied landraces and cultivars, and its flour was appropriate for pasta making [79]. Polish wheat is rarely cultivated in Spain, southern Italy, Algeria, Ethiopia, or in warm regions of Asia [80] and should be considered as a neglected species. In Italy, until 1982, it participated as a mixture with *T. durum*, but afterwards, it was not collected [81]. An attempt to introduce Polish wheat in Madeiras, Portugal in the late 19th and beginning of 20th century was not successful due to its inability to adapt in Madeiran soil–climatic conditions [82,83]. Currently, Polish wheat is reconsidered for cultivation due to its tolerance to water deficits and its high protein content, which is significantly higher compared to common and durum wheat [84].

Mixtures of wheat and barley have also been reported in other regions of Greece, such as Lemnos Island [5]. The practice of intercropping different cereal species was selected by farmers to tackle the low productivity that wheat and barley were facing in the area [49]. One such example is "Smigadi", a mixture of wheat and barley which was primarily used for making bread [49]. According to Aivaliotakis [49], rye was grown in small areas only in the mountainous regions. This was also confirmed by many of the interviewees. Landraces of these two crops have been extinct in some countries of South Europe, like Bosnia and Herzegovina, Croatiam, and Serbia, whereas they still survive in North Macedonia and Bulgaria, according to Simeonovska et al. [85]. The condition of maize in terms of genetic erosion in other areas, such as Arcadia [28] and central Italy [86], is similar to that of Messinia, whereas in areas like Lesvos and the Lefkada Islands [16,25], the genetic erosion is significant. As in other countries of South Europe [86], maize is cultivated in gardens in Messinia. As reported by Aivaliotakis [49], maize was grown mainly in intercropping systems with pulses (green beans) in lowland areas, while in mountainous areas, it was also found as a sole crop [49]. Despite the rich agrobiodiversity of cereals in the past, diversity has been significantly reduced, mainly due to the introduction of other cultivars. The same phenomenon also occurs in other countries; in Turkey, wheat morphotypes were reduced by 75.5% between 1920 and 2010 [4]. The spatial and altitudinal distribution of many wheat landraces is of particular interest, showing a degree of adaptability to the local conditions [76] and eventually a better performance, leading to their selection by many farmers.

4.2. Pulses

Common beans have been grown in significant quantities since the beginning of the 20th century, often under irrigation (Table 5); however, without significant recognition compared to other cash crops (e.g., olives trees, grapevines) [87]. Aivaliotakis [49] mentions "Tsaoulia" or "Anevra" (without nerve), meaning without pod string, a desirable trait for fresh pod consumption, accounting for 40% of the production. "Kathista" (sitting, which is the bush type bean) accounted for 50% of the production, as well as "Barbounia" (striped, red mullet known as mullet beans, with a color similar to that of the red mullet fish). In his effort to classify local common beans, Panou [60] concluded that six main landraces were found in Messinia in the 1950s: "Aspra fasolia", "Tsaoulia Messinis", "Fragofasoula" or "Anevra", "Gigantes", and "Black Barbounia Messinis", each with distinct morphological characteristics (Table 10). These names were also mentioned by Aivaliotakis [49].

Table 10. Local names, classifications, and morphological traits of common bean (*Phaseolus vulgaris*) landraces based on the taxonomic treatment of Ditmer et al. [88] originating from Messinia (based on ref. [60]).

Specific Name	Meaning	Type	Botanical Variety	Growth Type and Length	Flowers	Pods	Seeds	
							Morphology	1000 Seed Weight (g)
Entopia kathista Tsaoulia Messinis	Local bush type Tsaoulia of Messini	Mountainous	Oblongus × Compresus, Major Bruneo—Cremeus, Bruneo Marmoratus	Dwarf (35 cm)	Violet	Straight, falcate, length 8–14 cm, with 4–6 seeds	Large, cylindrical, kidney-shaped, brown–cream with brownish mottled patterns. Dimensions: 17 × 8 × 7 cm	460
Nana Philiatron Triphylia	Dwarf of Philiatron at Triphylia	Mountainous	Oblongus Roseo—Bruneus Bruneo–Marmoratus	Dwarf and climbing	Light violet		Cylindrical, red–brownish with dark brown mottled patterns. Dimensions: 15 × 8 × 6 cm	350–400

Table 10. *Cont.*

Specific Name	Meaning	Type	Botanical Variety	Growth Type and Length	Flowers	Pods	Seeds	
							Morphology	1000 Seed Weight (g)
Aspra fasolia	White bean			Dwarf			White, green–eggplant colored, red, yellow	
Fragofasoula (syn. Anevra)	Franks' bean (syn: nerveless)			Climbing		Plate shaped, fleshy, green, without fibers	Plate shaped, white or chocolate brown	
Barbounia				Climbing		Plate shaped, without fibers	Globose, white	
Gigantes				Climbing				
Barbounia mavra Messinis	Striped, red mullet or surmullet black of Messini	Forest	Ellipticus × Sphaericus Niger	Dwarf (25 cm)		Straight, dark violet	Ovate–spherical, black. Dimensions: 13 × 10 × 8 cm	

The name of the landrace was regularly followed by an additional name depending on its growing type, either prostrate ("Kathisti", meaning "sitting", which is the bush type) or climbing ("Kalamiou", meaning "on the reed") concerning the "Tsaoulia" landrace. Such common bean diversity is still present in South Europe [89–91].

The broad bean collection showed that the genetic pool of broad beans in Messinia is still rich despite it internationally being considered as a neglected crop [92,93]. Such landraces could present significant heterogeneity within populations for many agronomic traits like pod length, number of flowers per inflorescence, etc. [94].

Cowpea (*Vigna unguiculata*) is a crop with a long history, and its local populations are well-adapted to the Southeast Mediterranean basin [95]. Lazaridi et al. [96] studied three Messinian cowpea landraces originating from different villages, namely Neda, Metamorfosi, and Marina. These populations were classified in the same group, along with 14 landraces and 1 cultivar, expressing common morphological characteristics like the cream/white seed coat color, brown or black-eyed colored hilum, and splitting of the testa. Within this group, the populations from Marina and Neda showed differences regarding their seed weight, while the one from Metamorfosi exceeded the level of 25% protein content, a common characteristic of most cowpea varieties (ibid.). In another study assessing the fresh pod traits, among the fifteen cowpea landraces with Southern European origins, the population from Metamorfosi showed 9.93 days to harvest from pod bearing. Therefore, it was characterized as later than the majority of the populations used, with 9.94 locules per fresh pod on average; the lowest value (among the populations of Greek origin) based on the results of Tukey's mean comparison method [96].

Lupin is considered as a neglected crop; however, it has recently received significant attention for its agronomic and dietary benefits, while in South America, substantial efforts are being made for the commercialization of both indigenous (*Lupinus mutabilis*) and imported (*Lupinus albus*) species [97–100]. In Messinia, lupin was first introduced in the late 1920s. Due to its adaptability and tolerance to marginal soils, it was first grown in the poor soil of Kalamata, Messini, and Trifylia, among other places [48]. According to Aivaliotakis [49], many different varieties of lupin were grown in Messinia. Today, the partial or complete replacement of wheat flour with lupin flour in cake making is studied due to the specific nutritional properties of legume flours compared to wheat [101].

Lablab is considered as underutilized/neglected crop [102] for both human and animal consumption. Different fresh pod colorations have been described by Kongjaimun et al. [103]. Although its cultivation in Greece is rare, it can also be found in other geographical regions of Greece. Apart from Messinia, it is cultivated in Rhodes, Crete, some islands of Cyclades, and in Central (Trikala) and North (Kavala) Greece [66]. Lablab beans are one of the most diverse domesticated legumes, and they were probably domesticated in Eastern and Southern Africa, which are the only areas where it exists naturally [103]. It was also found in in India's earliest Iron Age excavation site from 2000 to 1700 BCE, at Hallur in the state of Karnataka, and from 1200–300 BCE at the Veerapuram excavation site in the state of Andhra Pradesh [104]. Today, lablab beans are cultivated in relatively large areas of Asia, particularly in Bangladesh [104] and Africa [105]. In Europe, the cultivation of lablab beans is very rare. In Madeira (Portugal), lablab was first reported in 1868, when documental probes of human consumption were found. Today, it is still being cultivated, mostly for ornamental purposes in gardens, and can be seen in abandoned fields on Madeira Island [82,106]. In Spain, it is used for human consumption and as feedstock, but the extent of its cultivation is not clear [107]. In Italy, lablab can be commonly found in Lombardia [108], used as an ornament, or occasionally as a pulse [81], while it is grown as a naturalized alien species in Sicily [109]. Lablab has good potential as a rich protein crop, with a significant amount of macro- and micro- nutrients. However, it also contains anti-nutritional factors [105]. It is drought tolerant [105] and can be used to rehabilitate contaminated marginal lands, producing food [110].

Due to mung bean's significantly high diversity in South Asia, the crop is considered to have been domesticated in this area [111]. Burnt mung bean grains have been found from the Chalcolithic age (1500 to 1000 BCE) in Navdatoli, and from the Neolithic age (1800 BCE to 200 CE) in Chairand, Bihar, both on the Indian Subcontinent [112]. Mung beans are currently being cultivated in six million hectares in India, [113] and in many countries of Asia like China, Indonesia, and the Philippines, as well as in Africa, as it exhibits a remarkable adaptation to different environments [114]. Landraces of mung beans have a great plant breeding potential [115], and mung beans constitute a good source of dietary protein and micronutrients [113]. "Rovitsa", a mung bean landrace, is also mentioned by Belitsos [116] as a cultivated crop in the Avia municipality. The local interviewees also referred to its use in soups, which was also surprisingly found in the pages of gastronomic journals and also in food shops of Thessaloniki in 2021, with its origin being the municipality of Messini. Another area of cultivation in Greece is Kozani (North Greece) [66]. There were also reports regarding its traditional cultivation in Italy [81]. Mung beans seem to have a great potential for cultivation in Europe, as they can be found on the website of the Centre for the Promotion of Imports from developing countries [117] (The Netherlands), with United Kingdom being the largest importer of mung bean in Europe, and Netherlands being the top producer of mung bean sprouts in Europe. Moreover, in 2022, a USA company requested permission from the European Council (EC) to extract proteins from mung bean seeds so that they can be used in protein products; a request that was then approved by the EC [118].

Vetch (*Vicia sativa*) has a long history in Messinia, and landraces from Messinia were introduced and distributed in areas of Northern Greece during the mid-20th century due to their desirable traits (early maturation, high productivity) [119]. Bitter vetch (*Vicia ervilia*) seeds were not found during the expeditions, a fact indicating that it is no longer cultivated; a general trend of severe genetic erosion [120]. Similarly, Cyprus vetch (*Lathyrus ochrus*) is extinct from cultivation in Messinia, although in other regions such as Lemnos Island [5] and other islands of the Aegean Sea [121], this crop is still present.

4.3. Vegetables

Home gardens are one of the oldest land-use systems, and their multi-dimensional benefits including biodiversity conservation, socio-cultural preservation, and empowerment of marginalized groups, among others, have been widely acknowledged [122]. In many communities in Messinia, small-scale farming is applied, characterized by multi-cropping and traditional cultural practices which can host many species and many varieties within each species. These can be characterized as "hotspots" of agrobiodiversity [19].

The well-known tomato "Chondrokatsari" was described by Aivaliotakis [49] as being the most abundant in home gardens. It has also been registered as a conservation variety in the European Common Catalogue [123]. Greek tomato landraces present high genetic variability between and within landraces [124–126]. Moreover, seeds from the landrace "Stroggili" were collected: a landrace characterized by a smooth skin, large fruit, and late maturation. In the literature, it is also found under the names "Pachia" (fat), "Chontri" (thick), or "Nerouli" (waterish) [49].

Three domesticated squash species, *C. pepo*, *C. maxima*, and *C. moschata* can mainly be found in Greece, and the majority of the summer squash production was based on landraces maintained by farmers [87]. Currently, fresh summer squash production is based on cultivars, but many of the amateur gardeners in Messinia use landraces. Such high numbers of samples collected are not rare in the Mediterranean basin. An inventory in central Italy includes 100 collected accessions of *C. maxima* [86]. *Cucurbita pepo* landraces have the potential of great phenotypic variation, as was shown in a Spanish collection [127].

Okra is a summer vegetable that grows widely in Greece. Its genetic material consists of landraces and selections from local populations. Greek genotypes originate exclusively from old Turkish genetic material [128]. Ten okra samples were collected during our expeditions in Messinia. References regarding its cultivation were recorded in all the municipalities, with the name "Saliara" (slimy), likely because of okra's slimy texture.

Only one accession of radish was collected during collecting expeditions in 1942, which is currently being kept in the IPK genebank [64]. None were collected in the following expeditions, including ours; hence, this is an indication that it was not widely cultivated.

The Mediterranean area is the secondary center of origin for garlic; hence, it can be assumed that its cultivation in Messinia dates back to ancient times [129]. There were no specific local names mentioned for the collected landraces. According to Polyzos et al. [129], the garlic genotypes in Greece cover a wide range of phenotypic diversity, influenced by environmental conditions and cultural practices. Aivaliotakis [49] mentioned two landraces of cabbage, one with an early maturation time (50–60 days) and one with a late maturation time (60–70 days) that was heavier in weight. The cauliflower was named according to the maturation month, October, November, and March [49], but the seeds were not found. Home gardens host a wide range of species in many countries of the world which can reach impressive numbers, including 45 average species per garden in Ghana and Vietnam [130], as well as *Cichorium* sp., *Eruca sativa*, *Ocinum basilicum*, and *Spinacea oleracea* in Sicily [131]. In Benin, a survey of home gardens revealed not only the rich diversity of cultivated species but also the knowledge which local communities retain for their management [132]. The multiple functions (food production and non-food production) that home gardens hold create the potential to maintain specific and often neglected crop groups, and they also provide economic and nutritional security for rural communities [19,122].

4.4. Aromatic, Medicinal, Industrial, and Perennial Plant Species

Tobacco (*Nicotiana tabacum*) was grown in small quantities (Table 6) in the early 20th century, but today, it has disappeared in Messinia. Flax was an important fiber crop during antiquity in Messinia, and there is evidence that it was a common crop during the Mycenaean period (1700–1100 BCE) [46]. Its cultivation was widespread across Peloponnese at the beginning of the 20th century, especially in mountainous, isolated areas [87] (Table 6), and the interviewees referred to its cultivation in many villages. Messinian flax was characterized by a high seed and fiber productivity, but with a low quality compared to other Greek and international flax varieties [133]. However, today, it should be considered as lost. Flax cultivation in Greece has been abandoned due to its labor-demanding process and was seldom found on Lefkada Island [25]. Flax is a crop that can grow in marginal land without inputs, and it is drought-tolerant at the expense of a low productivity [134]. These traits can be exploited in view of climatic change. Flax landraces' germplasm can present a high genetic diversity like the one from Ethiopia [134]. Calabash is used as rootstock to graft *Cucurbitaceae* species to develop tolerance to abiotic stress and resistance to pathogens [135].

4.5. Perennial Crop Species

Regarding perennial plants (fruits, nut trees, olive trees, and grapevines), germplasm samples were not collected. However, their reference during interviews was extensive, and they all have been found in home gardens and in commercial farms. The information recorded during the interviews provided adequate insight into their diversity.

4.5.1. Fruit Trees and Nuts

Fruit species diversity is common in Greece [16,28] and in the Mediterranean basin [136]. Most fruit and nut tree species have been cultivated in Messinia since antiquity, while others were introduced later (e.g., pears).

The environmental and climatic conditions in Messinia are ideal for the cultivation of figs [137]. The landrace "Tsapelosykia" or "Kalamon" was grown across Messinia and more intensively in the municipality of Messini, which produced 50% of the total production in the 1960s. Today, it is still the main variety for the production of dried figs [137,138]. According to Aivaliotakis [49], "Tsapelosykia" was a single-stemmed local variety that used to mature from early August until September. It is interesting to note that two Messinian fig varieties, "Kalamon" and "Tsapelosyka", were analyzed for volatile and semi-volatile compounds, with 83 and 34 being identified, respectively [139]. The "Kalamon" variety had the most diverse volatile profile among the five examined varieties, and its unique liquor odor is organoleptically distinguishable among the other fig liquors (several aqueous ethanol extracts) [139]. As for the phenolic compound contents, the "Kalamata" variety was inferior compared to Turkish varieties and equal to Italian ones, while it contained vanillic acid and the anthocyanin flavonol rutin [140]. The fig varieties cannot be distinguished with certainty due to insufficient information, and more research is required. In a study regarding fig genetic diversity in the Mediterranean basin, four landraces from Messinia were grouped separately into three different clusters, although the Greek genotypes exhibited low allelic variation [141]. Overall, globally, fig species constitute a fairly narrow genetic base; thus, overlapping between local names and landraces should be expected [138].

Many of the pear local names could cite discrete landraces, but further research is required to confirm this. Many pear varieties were possibly imported, but they eventually lost their original name, adapting to the local culture. According to Aivaliotakis [49], seven main pear varieties were grown in Messinia, locally named "Theristapida" (harvest pear, meaning that they mature during the harvesting month), "Milapida" (apple pears, meaning that they have the shape of an apple), "Avgoustiatika" (August pears, meaning that they mature in August), "Kolokythapida" (squash pears), "Kontoules" (dwarf), "Kampanes" (bells, meaning having the shape of a bell), and "Krystallia", the latter being the introduced variety named Napoleon (or Spada, Spadona). The expeditions revealed that these main varieties are still preserved in Messinia, and they were all recorded during the expeditions except the landrace named "Milapida". Rich pear diversity was also found on Lesvos Island, where 54 pear variety names were recorded [16], and on the island of Sardinia, on which 74 samples were collected [136]. Nevertheless, the existence of synonyms and homonyms is always a grey area regarding the local names of landraces. Regarding pear diversity in Portugal, Queiroz et al. [142] found in their study that four pear indigenous varieties had two synonyms each, whereas others were homonyms.

Lemon tree cultivation has an old history in Messinia, and names like "Chondrolemono" (fat lemon) were reported by Aivaliotakis [49]. The same author [49] described two categories of lemon trees according to their time of flowering. The first type flowers once per year, and five landraces with distinct morphological characteristics belong to this type. The second one flowers many times per year, in which two landraces belong (Table 11). Therefore, it is worth investigating the lemon diversity of Messinia, as was done in Sicily, where the molecular investigation of three principal varietal groups, namely "Femminello", "Monachello", and "Lunario", was carried out. All local germplasms [143] constitute different local varieties, each including a phenotypically and genotypically diverse range of plants [144]. In total, out of the 39 Sicilian lemon accessions studied, 22 were identified as unique. It was concluded that genetic isolation helped to preserve several genetically different lemon landraces [144].

Table 11. Lemon landraces based on morphological characteristics in Messinia (based on ref. [49]).

Time of Flowering/Year	Size of Fruit	Flavedo
Once	Small	thin
	Small	thick
	Medium	thin
	Medium	thick
	Large (like citron)	-
Many	Small	thin
	Medium to large	thick

Many varieties of oranges (*Citrus* × *sinensis* (L.) Osbeck) were grown in Messinia by the mid-20th century. The most prominent was "Koini" (common), which is divided into two different varieties, one with a light-yellow color, thin flavedo, and sour taste, and the other with a dark color, thick flavedo, and sweet taste [49]. The other varieties included "Artas" (from Arta region), "Kriti's" (from Crete), Sangouini" (blood orange), "Malteziki" (from Malta), "Yiafas" (from Haifa), and navel oranges [49]. In a review of sweet orange diversity, it was concluded that despite the morphological differences, sweet orange genetic variation was low [145].

One local variety of pomegranate (*Punica granatum*) (accession 11003) from the region was studied for different phenotypic characteristics, and its content in juice per fruit (as %) was very close to the mean of the 47 examined accessions and cultivars [146]. The same was observed for the edible portion of the fruit, but not for the fresh weight. Another accession (ER9) collected in the region originated from another prefecture of Peloponnese (Argolida) and belongs to the famous Ermioni pomegranate group, which exhibits a better score in all phenotypic characteristics [146]. Four landraces of cherries (*P. avium*) were recorded, including "Agriokerasia". Hatziharissis et al. [147] mentioned the cherries (*P. avium*) landraces "Karamela", "Lamboudi", "Petrokerasa", and especially the potential of "Lamboudi" to resist pathogens and dry conditions, an interesting feature for the climatic change that Earth is facing. The genetic affinities with other cherry landraces should be investigated, like in Basilicata (Southern Italy), where the landraces of that area exhibited genetic relationships with landraces from other Italian regions, especially Campania, and some genotypes were more closely related to foreign varieties [148]. Sour cherry (*P. cerasus*) presented the names "Mikro" (small), "Xino" (sour), "Xanthokokkino" (blond–reddish), and "Mavro" (black) [49]. In the case of chestnuts, it can be assumed that the genetic diversity in Messinia is the same as in Arcadia, the bordering prefecture, where chestnut populations were examined from five neighboring villages and exhibited little genetic diversity among them, a result which may be attributed to a local genotype in Arcadia [149].

4.5.2. Olive Trees

Olive trees (*Olea europaea*) are interweaved with the history of Messinia. The first evidence of their cultivation and use dates back to the 13th century BCE [38]. During the Ottoman period, the famous Ottoman traveler Evliya Çelebi in his work *Seyahâtname* ("Travelogue") refers to the olives of Koroni as famous, named "Koron zeytunu" [150] (zeytunu = olives in Turkish) in 1668. The relationship between olive trees and Messinia grew substantially, and currently, in Messinia, olive trees cover an area of 80,175 ha. With a total annual production of 50,000 t, it is the dominant crop and the main export product of the region [151]. According to Kostelenos [152], five indigenous varieties, "Kalamon", "Koroneiki", "Mastoidis", "Mavrolia", and "Tragolia" are grown in Messinia (Table 12), with "Kalamon" and "Koroneiki" having the highest spatial distribution not only in this prefecture but also in many other regions of Greece. A comparison of the morphological parameters of seven Greek olive varieties showed that the average fruit area values in position A, which is a specific position measurement, indicated that "Koroneiki" and "Mastoidis" were clustered into the small fruit group and "Kalamon" was in the intermediate fruit group, while "Kalamon", "Koroneiki", and "Mastoidis" had elongated fruits. Regarding leaf size, "Kalamon" had the largest leaf, while "Mastoidis" and "Throumbolia" had smaller leaves. Concerning the endocarp, again in position A, "Kalamon" had a larger endocarp, and "Koroneiki" and "Mastoidis" had smaller ones [153,154]. These five varieties were grouped together, and in general, the studied Greek varieties were distinct from the Turkish varieties and were dispersed with the Italian ones [155]. In another study in which the use of high-quality SNPs was applied in order to investigate the genetic relationships of 76 olive varieties from the Mediterranean basin, "Kalamon" was grouped in cluster NORTH-A MED (North Mediterranean A), while "Koroneiki", "Mastoidis", and "Tragolia" were grouped in cluster NORTH-B MED (North Mediterranean B) [156]. From the viewpoint of this paper, it should be mentioned that the Messinian origin of the genetic material used in the above studies clearly did not take into consideration that their region of origin extended beyond Messinia (Table 12). Nevertheless, the value of such research is important, showing basic trends in morphologies and molecular levels.

Table 12. Indigenous olive varieties originating from Messinia [152].

Variety Name	Area of Origin	Use	Seed Weight (g)	Seed Size-Surface	Oil Content (% of Fresh Weight)
Kalamon	South and West–South Peloponnese	Table	5	Middle sized, rough surface	16
Koroneiki	West, South Peloponnese and Crete	Oil	1.1	Small sized	20–25
Mastoidis (common)	Central, West, South Peloponnese and Crete	Table	5.5	Middle sized, rough surface	16
Mavrolia Kalamon	Messinia	Oil	1.3	Small sized	18–22
Tragolia	Messinia	Oil	2.2	Small sized	22–28

Synonyms of the above-mentioned varieties have also been reported by other researchers, who also present the morphological differences of "Kalamon" and "Koroneiki" varieties [157]. Greek olive classifications, and consequently their use, are traditionally based on fruit size. Large fruits are reserved for table use, while small-seeded varieties are used for olive oil production (Table 12) [158]. As documented by Kostelenos [152], regarding the table olive variety "Kalamon", the names "Mpourakla", "Chontrolia" or "Kalamatiani" were also mentioned during the expeditions. The name "Mavrolia" was also recorded as a synonym of the variety "Choraitiki" (meaning "from the village"). Olive tree diversity in Messinia should be investigated in detail, and more varieties and ecotypes are likely to be discovered, as is the case in Iran [159]. From an agronomic point of view, olive germplasm has also been investigated for abiotic and biotic stresses. Among the nine indigenous Greek olive cultivars, "Koroneiki" was not salt tolerant [160]. According to another study, the total dry weight of this variety was significantly reduced by salinity, and it has a moderately salt-tolerant behavior [161]. In a trial for resistance to *Verticillium dahliae*, nine olive varieties were tested. "Koroneiki" and "Tragolia" were among the most resistant ones, while "Mastoidis" proved to be sensitive [162]. For the above-mentioned varieties, the exact geographic origin was not reported.

4.5.3. Grapevines

A peculiarity of the Peloponnesian vineyard is the fact that several varieties are included under the generic name "Mavroudi" or "Mavro", which is usually accompanied by a place name (e.g., Kalavryton, Arachovis, Nemeas, Kolliniatiko, etc.). Regarding the grapevine cultivar "Agiorgitiko" [67,71], the most important red grape cultivar of the Greek vineyard, many synonyms have been mentioned, including "Mavroudi Nemeas", "Mavro Nemeas", "Mavrostafylo", "Mavroudi", "Mavraki", "Karvouniaris", and others [69,70]. However, as shown by the ampelographic description and the use of biochemical [163] and molecular markers [164,165], the grapevine cultivars "Karvouniaris", "Mavraki", "Mavroudi", "Mavrostafylo", and "Kolliniatiko" are different both from each other and compared to "Agiorgitiko", whose actual synonyms are "Mavro" and "Mavroudi Nemeas", under which the variety was formerly known.

The grapevine cultivars "Aitonychi aspro" (Aitonychi = the nail of eagle, aspro = white) [67,69–71] and "Aitonychi mavro" (mavro = black) [67,69,70,166] are different [167], although the basic name is the same (Table 7). Particularly, the former was very common and widespread in the Mediterranean countries and is referred to as "Aëtonyki" (synonyms: "Aïtoniki", "Aethonichi", "Actoni Maceron", Raisin à serres d' aigle) by Guillon [168] and as "Aetonychi blanc" by Viala and Vermorel [169]. Following the spread of seedless table grape varieties, their cultivation has been significantly reduced. Due to the similarity in shape and color of the berries to the olive fruits of the olive tree traditional variety "Kalamon", "Aitonychi mavro" is known in the viticultural areas of Messinia under the name/synonym "Elia", while the name "Eptanychi"/"Eftanychi" is probably a synonym of the grape cultivar "Aitonychi aspro". On the contrary, the name "Kerino" is a synonym of the grape cultivar "Razaki" and not of the grape cultivar "Aitonychi aspro".

The grapevine cultivar "Agoumastos", which has been mentioned on many occasions by the locals (Table 6), exhibits significant morphological and genetic heterogeneity as well as several possible synonyms ("Agiomasto", "Azoumastos", "Agoumisto", "Agourmastos", "Gidovizi", etc.). According to Krimbas [68], it refers to the variety of the antiquity "Bumasti", mentioned by Coloumella (4–70 C.E., De re Rustica, book III). Etymologically, the name derives from the name "Gourmazo" [Gr. to mature, ripen] [170,171], which with the prefix "a" (deprivation prefix), agourmastos > agoumastos, implies that the grape is unable to ripen, instead acquiring the typical color of the berries, which in the case of "Agoumastos" is rosé/reddish.

The name/synonym "Varia" refers to the white Cretan grape cultivar "Plyto", which is also known as "Kitrinovaria" and "Asprovaria" [74], and which appears also in the neighboring prefecture of Arcadia [28].

"Korychi" is mentioned for the first time as a cultivar name in 1643 by the monk Agapios (secularly known as Athanassios Landos from Crete), referring to a cultivar with reddish berries, and which according to Logothetis [172] is in fact the grapevine cultivar "Korithi kokkino". The dual-purpose grapevine cultivar "Korithi mavro" or "Petrokoritho" is reported to be cultivated in several areas of Messinia and the Peloponnese in general [69]. Of course, further research is required regarding the group of varieties/synonyms/variations under the generic name "Korithi".

The name "Samiotiko" suggests the origin of the variety from the island of Samos. It primarily refers to grape cultivar "Moschato aspro" (synonyms: "Moschoudi", "Moschato aspro Samou", "Moschato Riou", "Muscat de Frontignan", etc.) [173], while "Moschostafylo" is an altogether different variety. "Samiotiko" is also used as a synonym of the red grape cultivar "Fokiano", which is cultivated in the prefecture of Messinia and is known in some areas as "Smyrneiko".

In the prefecture of Messinia, the name "Kritiko" generally refers to the grape cultivar "Liatiko". "Avgoustelidi" (in other areas "Avgoustolidi") is a synonym of the grape cultivar from Zante, "Goustolidi" ("Goustoulidi", "Avgoustoulidi", "Vostylidi", etc.). The grape cultivar "Provatina" constitutes a biotype/clone of the grape cultivar "Syriki" [166].

The grape cultivar "Kolliniatiko", which was recorded in the village of Dimandra, municipality of Ira, exhibited particular importance. According to the interviewees, it is a 300-year-old cultivar used for rosé wine. The comparative ampelographic study showed that the name "Vergiotiko" (meaning the one originating from the historical community of Verga) is a synonym of the grape cultivar "Kolliniatiko". "Kolliniatiko" was transferred from Kollines of Arcadia (where it is known as "Evgeniko") to the viticultural areas of Messinia [166].

Different varieties were observed in the mountainous and lowland areas and were mentioned by the interviewees. In mountainous villages, wine production was based on varieties such as "Asproudia", "Fileria", "Moschata", "Skylopnichtis", "Aitonychi", "Roditis", and "Eftakoilo" [174]. All these varieties were recorded during the AUA expeditions (Table 7), demonstrating that the mountainous regions are still preserving a diversity of grapevine varieties.

The grapevine variety "Roditis", one of the most widespread varieties in Greek vineyards, is widely cultivated in Messinia, exhibits a high degree of genetic heterogeneity, and has many synonyms, homonyms, and variations (mutations). The use of the ampelographic description in combination with the use of molecular markers [175] showed that "Tourkopoula" is a different variety and not a synonym of "Roditis", whereas "Alepou", "Sakoroditis", and "Rodomousi" are indeed synonyms [166].

Xanthopoulos [87] mentions that in the extensive lands where grapevines were being cultivated, the most dominant variety was "Mavrofileri", which was used for wine production and is a variety that has been frequently recorded during the AUA expeditions. In the National Catalogue of grapevine varieties, the (reddish) variety "Fileri" is mentioned, which in fact constitutes the generic name of a heterogeneous group of varieties. A research study employing a combination of ampelographic descriptions and molecular markers RAPD showed that the biotypes "Moschofilero" and "Mavrofilero" are identical, while there is very high degree of genetic similarity between the biotypes "Asprofilero", "Xanthofilero", and "Kokkinofilero", which are in fact mutations of the grapevine cultivar "Moschofilero" [176] but lack (or are characterized by a low degree of) its aromatic character [71]. On the contrary, the grapevine cultivars "Fileri Attikis", "Fileri Menidiou", and "Fileri Tripoleos" are closely related with one another but are different from "Moschofilero/Mavrofilero". In the viticultural areas of the Prefecture of Messinia, the typical variety "Moschofilero" (Mavrofilero) was recorded, as well as the biotypes "Asprofilero", "Kokkinofilero", and a biotype known as "Fileri Flokeiko". In some areas, certain biotypes–clones of the closely related varieties "Fokiano", "Erikaras", "Giouroukiko", and "Armeletoussa" are mentioned as "Fileri" [177].

The names "Vapsa", "Vafiko", "Platana", and "Koutsavitiko" (the later coming from the village Koutsava Lada, near Mt. Taygetos) (Table 6) could constitute possible synonyms of the French grapevine varieties "Cinsaut" or "Alicante Bouschet", which were transferred from France to Greece. However, further comparative study on typical and representative samples of the above-mentioned varieties is required, employing both ampelographic descriptions and molecular analysis. "Alicante Bouschet" is one of the few teinturier grapes that belong to the *Vitis vinifera* species (cépages teinturiers), in which anthocyanin pigments accumulate not only within the skin but also within the pulp of the grape berry itself [178]. The name "Vafissa", which is also found in some areas of Messinia, is often considered as synonym of the grapevine variety "Mandilaria" [163], However, it does not have teinturier properties.

The name "Merkouri" (and "Merkoureiko") is a synonym of the Italian grape cultivar "Refosco", which was transferred in the 19th century from Friuli, Italy to Korakochori, Greece by Theodore Merkouris, with its current cultivation center being the regional unit of Elis.

"Korinthiaki staphida", an old indigenous variety of Greece/Peloponnese, is also cultivated in large areas in Messinia, while the raisin (currant) produced is known in the international trade as Kalamata, which in addition to the place name, also indicates the quality category. This cultivation was introduced to the area in 1828 in the place of the destroyed olive yards after Ibrahim's departure [45]. Due to its long cultivation, the variety has many synonyms, including "Mavromata" (Table 7).

The varieties with the names "Asproudi/Asprouda", "Asprostafylo", and "Aspro Melissaki" belong to the large group of varieties under the generic name "Asproudia/Asproudes". Usually, the name is followed by a place name or a characteristic of the berry.

The names "Krasostafylo", "Krasoudi", "Proimo", "Proimadi", "Kokkinostafylo", "Mavrostafylo", "Chimoniatiko", "tou Kapetanaki", and others may be referring to several wine grape varieties. For example, "Chimoniatiko" implies a late-ripening variety, which ripens the grapes or keeps the grapes on the vines until December. In the case that it has grapes with white berries, it is the grapevine variety "Opsimo Edessis", while if it has grapes with reddish berries, it is grapevine variety "Sideritis", which in the areas under study is also referred to as "Krok". In any case, for the identification of these varieties, as well as those of "Ammoskia", "Asfaka", "Bournela", "Livanaki", "Mantineia", "Glikerythra", etc., a full ampelographic description is required.

Overall, the Messinian vineyard, although dramatically reduced from 10,282 ha in 1940 [49] (Table 3) to 1360 ha today, hosts a wide range of varieties. These are common throughout Greece or found more locally, but all of them have adapted to many micro-environments. The varietal diversity shows that there are varieties with a long local history, whereas others were transferred from places like Crete and Samos. Most of the recorded varieties have white berries, and they are used for wine production. Nevertheless, 11 of them are for table use and 10 are for both wine and table use. In Messinia, black currants are also cultivated, which are a variety grown exclusively in Peloponnese and on some Ionian Islands.

Moreover, indigenous grapevine varieties, as well as their biotypes, are becoming more important and are currently gaining visibility owing to the better adaptation that they exhibit to local climate conditions compared to foreign ones, which is expressed by their phenolic potential [179].

Some varieties are commercially utilized, while others are of minor economic importance. Nevertheless, varieties with interesting features could exist among them, like "Sklava", for example, a local variety which remained relatively unknown until some decades ago. Its cultivation is now expanding rapidly thanks to its ability to adapt to dry and infertile soils [71].

4.6. Perspectives on Collection and Conservation Statuses

The rapid urbanization that took place during the 20th century triggered a huge shift in food systems, eventually driving agriculture into an unprecedented uniformity and resulting in the loss of many genetically variable crop varieties. Agriculture has a double and contradicting function, as it contributes to the conservation of biodiversity but is also a driving force for the loss of biodiversity [12]. The disappearance of landraces due to genetic erosion is still in progress, and fewer farmers around the world maintain genetic pools within their local biological, cultural, and socio-economic contexts [8]. Finding areas that preserve agricultural traditional knowledge and landraces and identify their cultural background is of profound importance to conserve genetic diversity and to harbor the adaptive capacities of agricultural ecosystems [13,17]. The present study shows that Messinia preserves its agrobiodiversity wealth for most crop groups, and that landraces conservation statuses have not diminished dramatically compared to the past monitoring of agricultural diversity studies [48,49] and expeditions. Further study is required to make an accurate distinction and precise numeration, while there are 448 additional villages that were not visited, which can add more information and material. It is also worth mentioning the linguistic dimension that unravels through local names, highlighting their importance as cultural elements. In most cases, varietal names signify morphological characteristics such as shape, texture, the color of skin and flesh, aroma, and flavor, as well as geographic provenance and growth qualities [180]. Moreover, factors of randomness, such as encountering the right people and the farmers' credibility and inclination to participate in the study, may have influenced the recording of the cultivated plant species and the number of samples collected.

A major factor is that despite the spreading of modern farming systems and the domination of olive monocropping production in large parts of Messinia, there are still areas where farmers practice traditional multicropping farming, maintaining the conservation and evolution of landraces [181]. Genetic erosion is also obvious in Messinia, as it happens globally at different paces. In five contrasting agro-ecological sites in India, Dulloo et al. [182] estimated that 50% of landraces should be considered as threatened.

Genetic erosion is visible, with annual crops being the most threatened crop species. Specifically, genetic erosion in cereals is advancing rapidly as a consequence of cultivars replacing landraces during the period of 1940–1960 (Table 8). Furthermore, a comparison of total production of cereals in Messinia in 1930 and today showed a shrinkage of almost nine times, from 18,730 t in 1930 to 2821 t in 2018. This is indicative of the decline in cereal cropping in Messinia, highlighting the loss of cereal landraces. As a result, a significantly lower number of cereal landraces were recorded compared to previous reports [48,49] and expeditions (e.g., IPK).

The pulses genetic material was retained, and a significant number of common beans, fava beans, and white lupin samples were collected during the AUA expedition. This highlights that a significant level of genetic variability in the pulses has been conserved, as is the case in other countries as well [183]. Many vegetable landraces were also recorded because of their cultivation in home gardens and their regular use in the local cuisine [130].

A prominent role of in situ conservation has been played by the old women of rural Messinia who protect and replant old seeds, sealing the cultural wealth and agrobiodiversity of the region. On-farm conservation receives increased recognition as a crucial part of in situ conservation strategies [13]. Additionally, geographic isolation and cultural heritage allow both landraces and traditional agricultural practices to be maintained. The registration of landraces into the European Register Catalogue as conservation varieties could also contribute to their preservation [184]. Local knowledge systems, which were developed through the spatiotemporal interaction of humans and the environment, can provide multiple sources of value in the form of nutrition, global healthcare, cultural awareness, and ecological conservation [185]. Perennial crops such as nuts, citrus, pome trees, and figs are cropped throughout the region of Messinia, both in commercial and self-production scales. These present great variability in terms of landrace name and likely genetic diversity. On the other hand, the production of grapevines has been reduced, mainly due to the socioeconomic benefits that olive production offers. However, a large number of grapevine names were collected for research to determine their status, as in other areas of Greece [74]. Furthermore, even though they were reported by the interviewees, Cyprus vetch, bitter vetch, beetroot, and carrot samples were not found, which may imply that they are permanently lost. On the contrary, tomatoes, common beans, and squash presented the most-reported crops. The value of the collected genetic resources is multiple, for climate change and drought resilience [186,187], local food, and as a source of income [7]. The case of Messinia is also an example for other regions, since the authenticity of this region, which is directly interlinked with landraces, enables local communities to emerge through agritourism [188].

The current study highlights that the preservation of landrace seeds is mainly a voluntary action undertaken by people who are trying to keep the traditional knowledge alive. Additionally, when traditional knowledge is lost, it not only damages the ecological status and the active use of the local genetic resources but also the cultural identity of the area [189]. Drawing attention to the inter-dependence of plant genetic resources and local knowledge to mutually protect them should be a priority. An organized, collective effort in the form of a demonstration garden where landraces will continue growing and young people could learn the importance of preserving the wealth of landraces' diversity could have multiple benefits for the community and for the biodiversity of the area.

5. Conclusions

Messinia has a long agricultural history, spanning from 2000 BCE until now. The continuous presence of basic Mediterranean agricultural crops like olives, grapevines, wheat, barley, and flax has been documented, with archeological findings and written documents originating at different times through the ages.

The present expeditions revealed that Messinia still possesses a significant number of landraces, even though many locals today are engaged with olive tree cropping. The hilly and semi-mountainous, mountainous, and isolated areas of Messinia play a prominent role in the conservation of these landraces, hosting large numbers of them. The collected samples represent both distinct landraces and various populations within the same landrace. The existence of the latter is noteworthy, since it increases the diversity and genetic base of each landrace. However, the actual number of landraces collected could not be easily concluded due to the existence of synonyms; hence, it can be lower (same landrace, different name) or higher (different morphological characteristics, same name). In the next phase, a genetic discrimination between all the collected genotypes will be carried out based on a genetic analysis. This will be used to determine the genetic similarity between them and to detect their genetic origins as well.

Messinia proved to be a hotspot of landrace diversity, especially regarding some neglected crops like *T. polonicum*, *L. albus*, *L. purpureus*, and *V. radiata*. The current study also shows that the overall wealth of landraces in Messinia has not been exhausted. A complete study in all the villages in the rest of the municipalities will reveal the true landrace diversity wealth of the studied prefecture and why it should be regarded as a hotspot of agricultural diversity. This can be a global paradigm for systematic genetic collections in the future. The results so far in the 133 villages and settlements that the study included are very promising, both in terms of breeding material and commercial value as niche products. These can further enrich and update national inventories while also promoting on-farm conservation of the local populations.

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