



## Article

# Who Remains When Professional Farmers Give up? Some Insights on Hobby Farming in an Olive Groves-Oriented Terraced Mediterranean Area

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**Abstract:** Many land use systems in Mediterranean sloping areas risk abandonment because of nonprofitability, while their hydro-geological stability depends on an appropriate management. However, who are the land managers? What are their practices? Our research on the traditional olive groves of the Monte Pisano (Tuscany, Italy) reveals for the first time the quantitatively important role of hobby farmers as land managers in the area. We used a three-step-method: first, a database was constructed using several data sources to identify and map the population of olive growers; then, 35 semi-structured interviews were conducted, and finally, the data were analyzed to highlight the contribution of olive growers to the land management, along with their motivations and constraints. Our results found that hobby farmers constitute about 90% of all land managers in the study area and manage more than half of the agricultural land. They are a very uneven group, and there are no clear categories detectable by analyzing sociodemographic factors, practices and farm characteristics. They are the “same but different”, not following any market rules, as they are not profit-oriented. Their farming practices are quite homogeneous and mainly in-line with professional farming practices of that area, oriented versus a minimum input management.

**Keywords:** hobby farming; olive groves; farming practices; peri-urban; stewardship

## 1. Introduction

Agriculture in the Mediterranean has faced many changes in the last decades [1]. Recent research focusing on Mediterranean land systems [2–4] underlined the importance of permanent crops all over the Mediterranean basin, often associated with rangelands or annual crops. Among these permanent crops, olive groves are an important part of the Mediterranean agricultural economy [5] and of the traditional Mediterranean cultural landscapes [1,6]. The olive tree is a symbol for the Mediterranean environments, and its distribution is often used to define the Mediterranean type of climate [7]. Most of the olive groves in the Mediterranean are located in hilly and mountainous areas and have been described as Sloping and Mountainous Olive Production Systems or SMOPS [8]. A part of these SMOPS are traditional groves placed on steep slopes with terraced grounds, which are a legacy of past human efforts to stabilize and exploit the sloping areas, though they have been gradually extensified or abandoned [6]. The extensification and abandonment of traditional terraced olive groves, most often rain-fed, nonmechanized and having low productive cultivars and old implantations, was chiefly due to the lower or null profitability against more recent intensive olive plantations [9]. These processes lead to different transitions in deep rural areas and in the areas under urban influence. In the latter,

the proximity to urban centers eased a substitution of the former olive grove managers by new land managers such as urban dwellers or newcomers having in common a lack of agricultural origin or at least of professional interest in agriculture. The landscape has a great ideal value, and urban people are willing to pay for living in mostly city-near environments. A desired life context and the possibility to cultivate for family needs are drivers different from profitability for managing these landscapes [10–15]. Altogether, we refer here to hobby or lifestyle farmers to the various profiles who take over where professional farmers give up.

Professional farming has been studied so far across different land systems, especially for peri-urban areas as dynamic and changing environments [16–19]. Yet, only few studies addressed the hobby farmers. This may be related to the nonavailability of official statistic datasets, as these land managers are not registered as farmers, enterprises, producers, etc., and their economies and practices are largely unknown.

There is still a gap to be filled in the definition of hobby farmers. Hobby farming has been a research issue starting from the 1970s and 1980s of the last century, mostly in the Western hemisphere and Australia [20,21]. There has been a development mostly in city-near, peri-urban areas or well-connected areas. Some examples of transition from professional to part-time and hobby farming were documented in Southern Europe in Montado/Portugal for commuters to Lisbon [22,23] and in Valdera/Italy for commuters to Pisa or Florence [24]. These land managers based their family income mainly on off-farm work.

Hobby farming is frequently associated in the literature with terms like small-scale farming, lifestyle farming, lifestyle landholding, amenity farming and noncommercial farming [13,20,25–29]. In recent years—mostly in 2014 and 2015—the term “lifestyle farming” has been used more frequently than hobby farming. Nonetheless, we adopt here hobby farming, as it implicates more distinctly the difference from professional farming. All farming might have a lifestyle component, but hobby farming is something done in one’s spare time.

Our thesis is that hobby farmers contribute to what nowadays is mostly expected from agriculture by the European Union: land stewardship. In areas where production hardly can achieve economical sustainability, people who are fond of living in a rural environment take care of the landscape and consider themselves paid back by the possibility of growing their own vegetables, fruit or else safeguarding the food for the family and living in a healthy way in close contact to nature [30]. Though, hobby farming is largely unrecognized by agricultural policy in Europe [23]; thus, hobby farmers are most of the times excluded from traditional resources of state support, such as agroenvironmental funding. Hobby farmers have been studied for their motivations, as well as economic and social impacts, but less attention has been paid to their agricultural practices and, so, to their impact on the landscape.

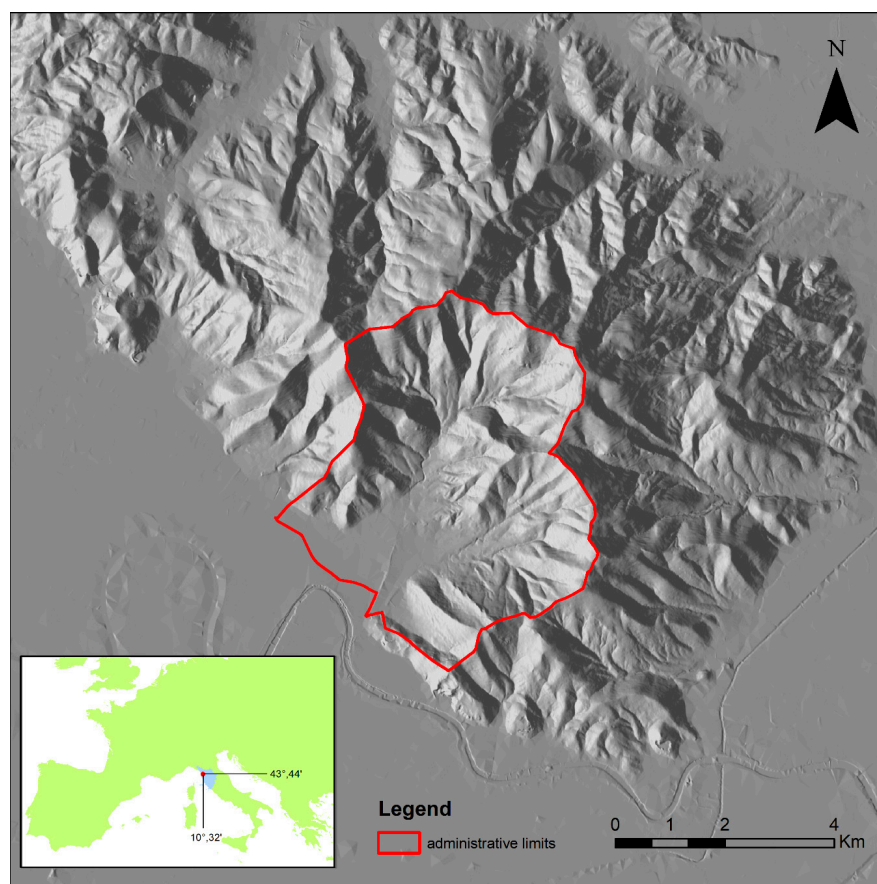
The aim of this paper is to unravel hobby farming within an Italian traditional-terraced olive grove system and to characterize the farming and landscape practices of olive growers. The case study was located in the municipality of Calci. It is part of the Monte Pisano, in the peri-urban area of Pisa, Tuscany. Some research already addressed nonprofessional olive growers in this area [31–33], but no study, to our knowledge, has dealt with the description of spatial distribution and characterization of these new land managers and of their farming practices. In addition, we compared hobby farmers with local professional olive growers to explore if their practices could result in different land use intensity. Our goals are to characterize at the local level a population of hobby farmers (“Who are they?”) and their contributions—in terms of main practices—to olive grove management (“What do they do?”), along with their motivations and difficulties, as well as potential for the land stewardship. In the end, we provide data for decision-makers at the local level to better understand the effects, problems and needs of the land managers of a common Mediterranean land system.

## 2. Materials and Methods

The method consists of a reproducible approach for data assessment of hobby farmers' research to draw a picture of these relatively unknown land managers excluded from the official data collection. The study area was chosen as representative of the Mediterranean olive groves, particularly those located on terraced grounds and peri-urban areas. The case study is located in a municipality that is well-integrated in the local context, and the method might be easily reproduced in the neighboring municipalities to gain an overview over the whole land system.

### 2.1. The Case Study Area

The municipality of Calci has a surface of 25 km<sup>2</sup> and is located at the foothills of Monte Pisano (917 m above sea level) nearby the medium-sized city of Pisa (Tuscany, Italy). The 6500-inhabitants town is structured in three historic parts: Montemagno, Castelnuovo and Tre Colli, all on a hilly position overlooking the valley, as well as the newer part of the settlement in the plains (Figure 1). The geomorphological asset is characterized by steep, slopy hills that were shaped, in the last 200–300 years, by human-made bench terraces with dry stone walls [34], a practice used in many similar hilly zones in the Mediterranean [1]. An in-depth description of the terraces in the area by Rizzo and colleagues [35] highlighted that about 22% of the total agricultural area in the Southern part of Monte Pisano was abandoned, two-thirds of which was represented by terraced olive groves. The climate is a typical Mediterranean climate with an annual rainfall of 883 mm, mostly in autumn, winter and spring, with July the driest month, and the average annual temperature is 14.6 °C. In the area, an increase of extreme rainfall events has been detected [36]; thus, the function of terraces as a drainage system has an increased importance with respect to the past.



**Figure 1.** Overview of the study area. The municipality of Calci, Pisa, Tuscany Region, Italy.

The dominant land use is olive groves, formerly in an agro-silvo-pastoral system with managed chestnut woods in the higher part of the hills and sheep pasturing under the grassy olive groves. Starting from the 1960s, the ending of sharecropping and the vicinity of the town of Pisa—providing new attractive employment opportunities—the traditional socio-agricultural system changed, including a growing abandonment of the olive groves. Early studies revealed the diminishing rate of professional farmers [31,32], while a growing share of the agricultural buildings were transformed into holiday or weekend homes for new land managers [37]. Current land use is almost completely specialized olive groves [35], with few, if any, use of drip irrigation nor mechanization, yet characterized by a high plant density, from 300 up to 1000 trees per hectare. Of notice, the orographic characteristics of the area avoided the transformation of olive groves into intensive monocultures, as occurred in most parts of olive groves in the Northern Mediterranean [38]. The dominant land is a degraded version of the typical agro-silvo-pastoral system, still present in other Mediterranean hills [39], where just the olive groves remain without pasturing nor cultivated chestnuts.

## 2.2. Data Acquisition: A Method in Three Steps

Statistical data on hobby farmers are often difficult to obtain, as they are not recorded in official statistics. For example, some hobby farmers in Italy may be registered, together with professional farmers, in the Land Parcel Identification System for the rural development measures, but not all of them. They all result as individual landholders without a farming profession. There is one national study that has been conducted exclusively on hobby farmers [40,41] by contacting readers of a lifestyle magazine. We wanted to verify these data on the local level.

The analyzed variables were deduced for the interviews covering the aspects farmer data, farm data and farming practices.

By limiting the study area to the municipality of Calci (Figure 1), we aimed at a clearly bounded administrative database having furthermore a homogeneous type of land use centered in olive groves. Additionally, the existence of a nearby local social oil mill allowed to gain access to reliable data on the local olive farmers. No official statistics or data were available about the nonprofessional farmers. Therefore, there was a need to find alternative ways to gain information on who manages an olive grove in their spare time. The data were acquired in three steps (Figure 2).

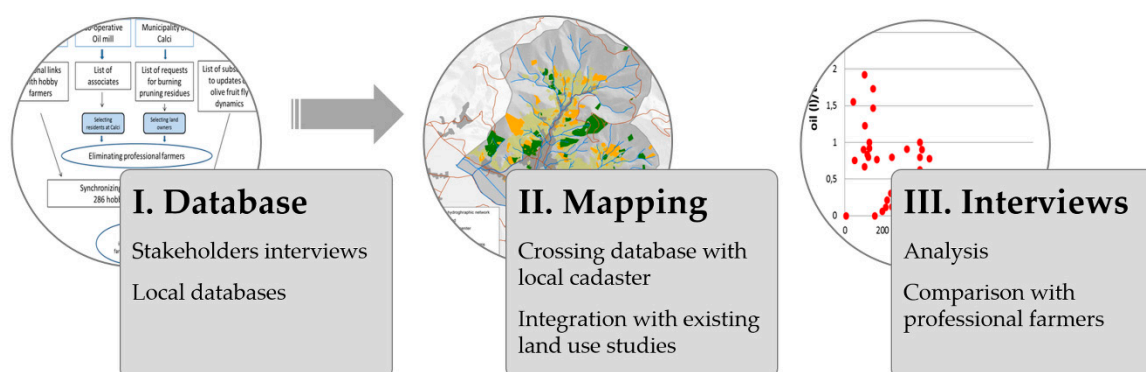


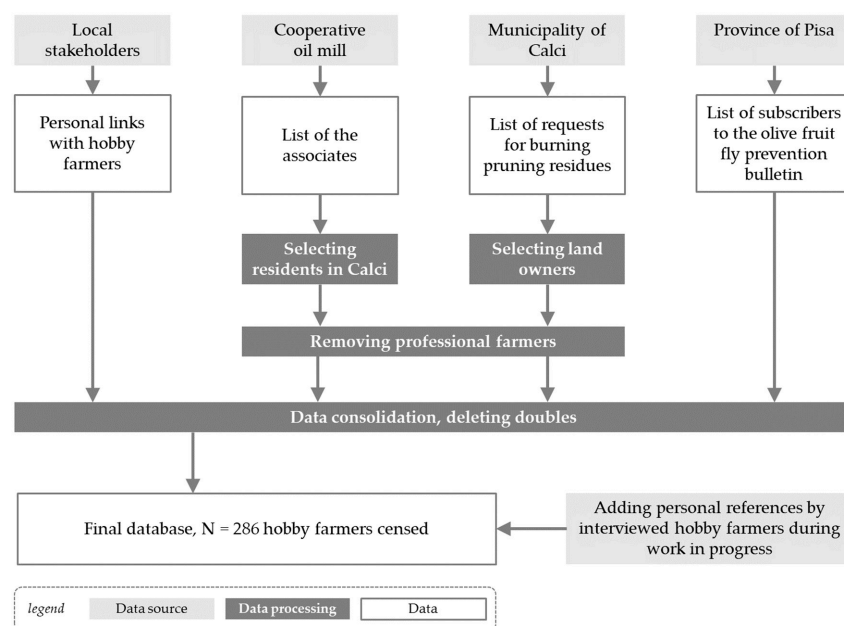
Figure 2. Outline of the method in three steps.

### 2.2.1. Database (Census)

To fill the census gap, the first step was the creation of a comprehensive database of the hobby farmers. This step drew upon the integration of four sources and some data cleaning and consolidation (Figure 3).

We started by some preliminary interviews with open questions to selected stakeholders. Four stakeholders were identified within the action range of hobby farmers: (1) a public employee of the land management office, also involved in the civil protection and fire prevention service of

Calci; (2) the director of the most important local cooperative olive mill; (3) the president of a cultural association that, amongst its activities, offers workshops on olive groves management (e.g., tree pruning methods) and (4) one of the professional farmers of Calci identified as an opinion leader and one of the initiators of the local ethical purchasing group and farmer's market. After a short introduction on the topic and purpose of the case study, the survey was focused on information on the local hobby farmers; their perceived environmental, economic and social impacts; the history of land management in the recent 30–40 years and the possible future developments in the territory, including the impacts of agricultural policies (at the European Union and regional levels). The interviewees provided also some names for first interview partners (Figure 3). The interviews, of a medium duration of 1 h, have all been recorded and, subsequently, transcribed and analyzed.



**Figure 3.** Hobby farmers census method.

An important data source was the list of the associates to the local oil mill. We extracted from this list the names of persons residing in the municipality of Calci, identifying 168 olive growers not reported as professional farmers. These hobby farmers mainly included landowners and, in a minor degree, also simple land managers. Indeed, there was no other way, at this step of the survey, to discriminate between olive groves at Calci or at the surrounding municipalities.

Thirdly, we had limited access to requests for authorization of burning pruning residues on the grounds (in total, 110 landowners—of which, 23 were already reported in the list of associates of the oil mill), choosing just the owners of olive groves. This limitation was considered necessary to mind the risk of censusing both the owner and the manager (if different) of the same land parcel. Based on the official list of registered olive farms at Calci, the owners of the professional farms were removed from the hobby farmers list.

Finally, the database was completed by using the list of subscribers to the olive fly prevention bulletin edited by the province of Pisa and distributed by email or SMS, as well as the list of farmers that participate on their farms to the samples collection for this service.

In total, we identified 286 hobby farmers that manage an olive grove in the Calci Municipality.

## 2.2.2. Mapping

The hobby farmers database was then crossed with the local cadaster to get information on the location of their managed land. We first localized the different land parcels by using the database of the local cadaster in ArcGIS 9.2 (ESRI). We extrapolated the professional farmers and their registered



owned farmlands. Secondly, public property or property of religious communities (Catholic Church) were identified. Based on raw data from previous research on the olive groves in Monte Pisano [36], we mapped the entire olive grove surface for the municipality of Calci, as well as the other land uses (Geoscopio Regione Toscana, <https://www.regione.toscana.it/-/geoscopio>). The overall olive grove area was then processed to map all the properties of the censured hobby farmers in the olive groves area and outside (mostly forest), as well as the professional olive farms. In the municipality of Calci in 2014, according to the Pisa Chamber of Commerce, there were a total of 29 active professional farmers; after controls from our side, we could confirm 28: one farmer was not active anymore.

### 2.2.3. Interviews

#### Hobby Farmer Samples

Due to the limited time for the study and the goal of testing the method, only a sample of hobby farmers included in the database was interviewed. The sample selection considered the variety of farm sizes, of the geographical location and of the land managers' ages. We did not target representativeness nor exhaustiveness but, rather, an overview of the existing hobby farmers. The final number of interviewed hobby farmers was further limited by the availability of a telephone number, as all primary contacts were taken telephonically, and of the hobby farmers for interviews. In total, the sample was composed by 35 hobby farmers who were interviewed.

#### Questionnaire

The semi-structured interviews aimed to obtain a complete picture on hobby farmers in Monte Pisano. The questionnaire was composed by 80 questions organized into seven parts (Table 1). The full questionnaire is available in the Supplementary Materials (<https://doi.org/10.6084/m9.figshare.12210023>). All closed questions included the choice of "others" to be defined by the interviewee. The open questions addressed the local context, such as the abandonment of olive groves in the neighborhood and the social context, as well as future perspectives of olive farming. The questionnaire was tested and validated with two local stakeholders and two olive grove hobby farmers from other parts of Tuscany.

The interviews were all conducted face-to-face by the same person, and each lasted between 1 and 2 h. They took place mostly at the home or at the olive grove of the hobby farmers but some also in public places or at our office. Generally, the responses were quite vivid; hobby farmers liked to talk about their spare-time activity and share their pleasure and also the problems they encounter. The interviews were carried out between February and May 2014.

**Table 1.** Sections of the hobby farmer questionnaire.

Section	Topic	Covered Contents
1	Historical data	History of ownership and management
2	Location	Farming area, accessibility, physical characteristics of farm territory
3	Olive grove management	Motivation, land use, labor time input, neighborhood context, estimated annual financial input
4	Farming practices	Use of fertilizers, herbicides, defense, grass cut, pruning frequency, use of machines
5	Harvest	Harvesting on all trees or part, number of harvesters, duration, medium harvest volume, data on oil mill, destination of oil
6	Knowledge on olive farming	Knowledge, problems, ideas, relation to other olive farmers, access to Common Agricultural Policy subsidies, estimation of input costs
7	Personal data	Nationality, gender, age, family composition, profession, education level

## Questionnaire Analysis

All questionnaires were completely answered. Firstly, a descriptive statistical analysis was performed. To characterize the hobby farmers, we chose a total of 32 variables for examining demographic data on the farmers (7 variables), farm territory characteristics (9 variables) and farming practices (16 variables) (Table 2).

**Table 2.** Variables and average values on hobby farmers.

Code	Content	Unit or Classes	Type
<b>Demography</b>			
id_citiz	Countries of origin	Italian, other	binary
id_gend	Gender	Male, female	binary
id_age	Age classes	4 classes	ordinal
id_age_bis	Bigger age classes	2 classes	ordinal
id_fam	Family size	Number of people	ordinal
id_prof	Type of employment respect to agriculture	4 classes	nominal
id_edu	Degree of school curriculum	5 classes	ordinal
loc_res	Residence on the olive grove	Yes, no	binary
age_det	Age	Years	continuous
<b>Olive grove features</b>			
st_terr	Time period of personal management of the olive grove	4 classes	ordinal
st_var	Variation in managed surface		ordinal
id_prop_st	Property by heritage or by purchase		nominal
name_res	Place of residence	3 classes	nominal
ol_size	Size of the olive grove	m <sup>2</sup>	decimal
ol_frac	Fragmentation of the olive grove	yes, no	binary
ol_no_p	Size of the grove	Number of olive trees	integer
loc_car	Accessibility by car	Yes, no	binary
loc_alt	Altitude of the olive grove	meters a.s.l. *	integer
<b>Farming practices</b>			
trc_sis	Management of dry stone walls	Yes, no	binary
c_fch	Use of chemical fertilizers	Yes, no	binary
c_pest	Use of pest control	Yes, no	binary
c_fly_def	Practices to control olive fly		nominal
c_gr_cut_xyr	Grass cuts	Number per year	ordinal
c_pru_freq	Frequency of pruning		ordinal
c_pru_burn	Burning on the olive grove	Yes, no	binary
h_pers_ext	External paid workers for harvest	Number	integer
h_vol_oil	Olive oil production	Liters per year **	decimal
h_oil_sell	Selling of olive oil	% on grove production	decimal
oil_plant	Productivity	Liter per tree	decimal
pp_ha	Grove density	Number of olive trees per hectare	decimal
h_plnt_perc	Harvest intensity	% of harvested trees on total trees	decimal
mng_cost	Costs for the olive grove management	€ per year *	integer
w_dxyear	Workload	Days per year *	integer
ol_mix	Type of uses of the olive grove	___ classes	nominal

\* Estimated by the respondent, and \*\* yearly average.

In the last step, we compared the results of the survey with a sample of 5 professional olive growers already surveyed in the same period and in the same municipality by Filippini et al. [16]. The statistical significance of the variables was examined by applying the Kruskal-Wallis test [42], which allows to test whether the mean ranks are the same in all the groups.

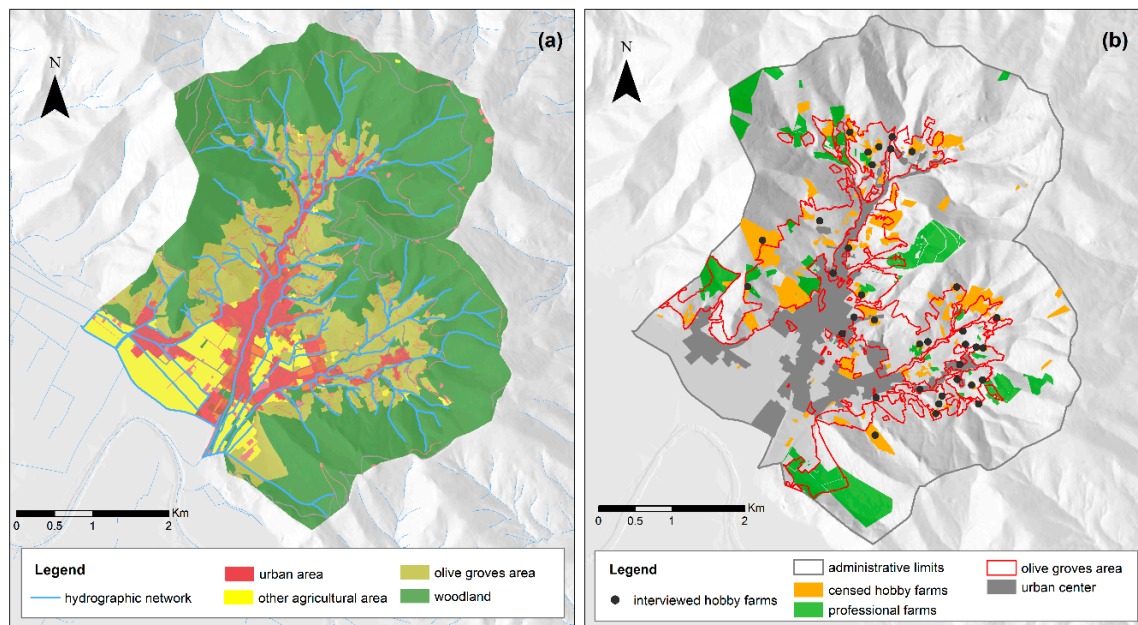
## 3. Results

The results of our study can be divided into two parts. First, the creation of the hobby farmers database ( $n = 286$ ), then mapped to provide information about their spatial distributions. Second, the analysis of the survey on a sample of hobby farmers to highlight their characteristics and practices.

### 3.1. The Olive Groves in Calci Are Mainly Managed by Hobby Farmers

The olive grove surface in the municipality of Calci occupied 575.8 ha for the year 2014. The surface managed by the professional farms (99.1 ha) was mapped and detracted from the total olive grove surface, as well as the public-owned olive grove areas (6.2 ha). The remaining surface was owned

by private people and managed or abandoned; only part of the 286 censused hobby farmers could be identified in the local cadaster (for instance, because the land property was frequently registered by relatives). The censused hobby farmers on who we had spatial information on the land properties (136 landowners) managed 84.5 ha of olive groves, having an average olive grove of 0.6 ha per person. The remaining 386 ha of the olive grove area could be attributed to be under management of not-surveyed hobby farmers—or abandoned (Figure 4).



**Figure 4.** Land use (a) and censused olive grove managers (b) in the study area. Most parts of the light green olive grove surface are to be considered as property of or under management of hobby farmers. A part of these is abandoned olive groves, i.e., not managed for the last 5 years, at least.

The 286 censused hobby farmers could be characterized in a whole only by gender. The hobby farmers were 70% male and 30% female, resulting from the given names. No further features were available for the whole sample. Age was known only in 33% of the hobby farmers: over 50% were of legal retirement age (over 65 years old), 34% between 65 and 40 and just four hobby farmers (4%) were less than 40 years old.

From the spatial analysis of the managed areas results, professional and hobby farms often also managed areas that had other land uses than olive groves mainly represented by forests in the upper part of the farmlands.

### 3.2. Characteristics of Hobby Farming in the Calci Municipality

A sample of 35 of the censused 286 hobby farmers was interviewed (12%), unravelling a picture of these land managers.

#### 3.2.1. Sociodemographic Characteristics of the Sample

The sample was composed mainly by males (76%); only one out of four interviewees was a female (26%). The age structure of these farmers was normally distributed, with a peak on the age class of 60–69 years, which was consistent with the age distribution mentioned in the previous paragraph. The surveyed hobby farmers were mostly Italian, but 11% were other European citizens (UK, German or Austrian), a higher rate than those of foreign residents in the municipality (5%). Nearly half of the sample belonged to a two-people households. The average family was composed of two or three members (Table 3).



**Table 3.** Sociodemographic characteristics of the hobby farmer sample ( $n = 35$ ); % refers to the total per item.

Age (Years)		Nationality		Family Composition		Occupation		Education	
30–39	12%	Italian	89%	1 person	11%	unemployed	9%	University	48%
40–49	14%	Foreign	11%	2 persons	46%	retired	48%	High School	14%
50–59	23%			3 persons	23%	employed	37%	Middle School	23%
60–69	34%			4 and more	20%	student	3%	Elementary	9%
>69	17%					prof. farmer	3%	NA	6%

Nearly 50% of the interviewed hobby farmers are retired from their jobs, so have much more spare time for their hobby. Another little group of hobby farmers that could have a lot of spare time is represented by the unemployed. This is a relatively new development: with the persistent economic crisis, people without a job try to make a living out of their land. The education level of Calci's hobby farmers is high: 48% had a university degree. On the national scale, the hobby farmers with university degrees make out only 16%, while the biggest group (41%) are farmers with a high school degree [42]. This high education level of the hobby farmers at Calci is presumably related to the characteristics of Pisa as important universities and a developed tertiary sector. The primary occupation of the employed hobby farmers ranged from professions in healthcare, public administration and specialized workers over artisans and freelance professionals to university professors.

### 3.2.2. Characteristics of the Hobby Farms

The origin of our sampled land managers is mostly by voluntary acquisition and not by heritage (Table 4); however, most of them have managed the olive groves since more than 10 years ago. Three out of five of them lived outside the olive grove, in the nearby town or in a proximal peri-urban area.

**Table 4.** Characteristics of the land ownership by the hobby farmer samples ( $n = 35$ ); % refers to the total per item.

Farmland Acquisition		Residence on the Grove		Management History (Years)	
Inherited	23%	No	57%	always in family	20%
Bought	71%	Yes	43%	50–31	14%
Rented	6%			30–21	11%
				20–11	23%
				10–1	32%

The median size of the managed area per hobby farmer is of 0.50 ha, most properties being between 0.10 ha and 1.00 ha (Table 5). For the management, the tree number is much more relevant for the labor input than the dimension of the olive grove, as tree density in this area ranges from 100 to 1081 trees per hectare. The number of trees managed by a single hobby farmer varies in our database. They manage each up to 450 trees, and just one hobby farmer manages a higher number of trees (750 trees). The average number of managed trees per hobby farmer is of 338.00 (1.19) trees and a median value of 224 trees. With the exception of three hobby farms, all are on terraced grounds, predominantly with traditional dry stone walls. Fifty-five percent of the hobby farmers have managed an olive grove for a long time, for more than 20 years, but there were a lot of “newcomers”, nearly a third of the sample, that have started only since a maximum of 10 years.

**Table 5.** Farm characteristics of hobby farmers sample ( $n = 35$ ); % refers to the total per item.

Area Managed (ha)		Trees Managed (Number)		Altitude (m a.s.l.)		Is Olive Grove Fractioned?	
0.06–0.49	43%	up to 150	37%	0–99	20%	no, one area dislocated plots	83%
0.50–0.99	26%	151–400	51%	100–199	23%		17%
1.00–1.99	23%	>400	12%	200–299	51%		
>2	8%			>300	6%		

Three quarters of the interviewed hobby farmers harvest on all trees on their property (Table 6). The production of olive oil varies between the single hobby farmers: ranging from 12.00 to 400.00 kg/year, with the median value of 150.00 kg/year (Table 6). Olive cropping in Monte Pisano is hardly profit-providing, even for professional farms with at least 1000 trees. We examined the economic aspects of hobby farming: the input (expenses for fertilizers and treatments, machinery, fuel, oil mill, external labor (Tables 7 and 8) and output (harvest and olive oil). Only eight hobby farmers declared to sell part of their olive oil (a percentage of 25% up to 80% of the single production). They produce between 100 and 400 kg (Table 6).

**Table 6.** Production variables of hobby farmer samples ( $n = 35$ ); % refers to the total per item.

Average Oil Production (kg/Year)		Oil Production (kg/Tree)		Selling of Oil		External Labor for Harvest		Harvested Trees (% on the Grove)	
<100	31%	<0.5	34%	yes	23%	yes	14%	>30%	9%
100–199	23%	0.50–0.99	40%	no	77%	no	86%	>50%	11%
200–299	23%	1.00–1.49	14%					>80%	6%
≥300	23%	≥1.50	9%					100%	74%
		NA	3%						

**Table 7.** Farming practices by hobby farmer samples ( $n = 35$ ); % refers to the total per item.

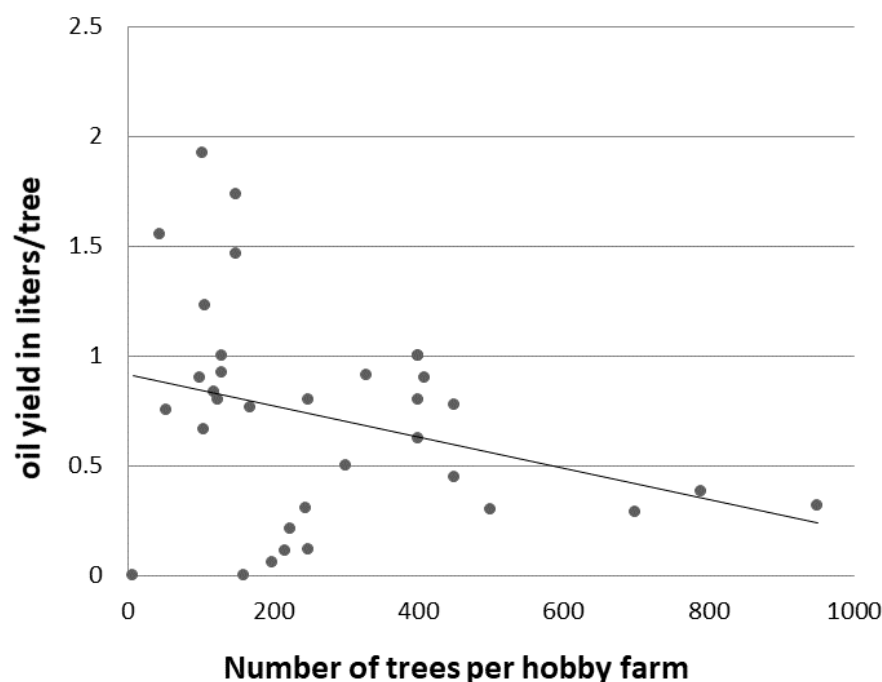
Apply Chemical Fertilizers		Apply Organic Fertilizers		Pest Control (Olive Fly)		Measures of Olive Fly Control	
yes	37%	yes	51%	yes	43%	none	60%
no	63%	no	49%	no	57%	traps	11%
						pheromones	11%
						copper, kaolin	9%
						chem. pesticides	9%

**Table 8.** Grove management intensity by the hobby farmer samples ( $n = 35$ ); % refers to the total per item.

Pruning Frequency		Burning of Residues *		Grass Cuts ( $n$ /Year)		Management Costs (€/Year) **		Work on the Groves (Days/Year) **	
None	3%	yes	80%	1	49%	<1000	57%	<50	26%
yearly	40%	no	20%	2	17%	1000–1999	25%	50–100	48%
every 2 years	34%			3	34%	2000–2999	6%	>100	12%
less than every 2 years	23%					≥3000	6%		
						NA	6%	NA	14%

\* Burning of pruning residues on the ground; \*\* rough estimation by the respondents.

The yield per tree varies from 0.11 to 1.92 L/tree, with a median of 0.78 L/tree. There can be various reasons for a very low yield—for example, any kinds of pests, low budgets of time and labor for the harvest, no interest in harvesting on all trees, etc.—but there appears to be a strong limitation for the maximum yield in correlation with the number of managed trees: 150 trees result in a maximum that is manageable efficiently with the harvest of all trees to achieve yields of close to 2 L per tree (Figure 5). The next limit is on 450 trees: All hobby farmers with more than 450 trees are not able to have yields of over 0.5 L/tree. This may be explained by the harvesting on only part of the managed trees, as labor is not unlimitedly available, and external labor has a high cost.



**Figure 5.** Production intensity, expressed as olive oil (L/tree) per the number of managed trees by the hobby farmers ( $n = 33$ , two outliers deleted from the figure).

The five hobby farmers that have the highest productivity (1.23 to 1.9 L/tree) per tree are all are male and manage olive groves of 1300 to 5000 m<sup>2</sup> with 45–150 trees on an altitude of 80–210 m above sea level.

### 3.2.3. The Hobby Farmers' Practices

The olive groves in the municipality of Calci are mainly composed by relatively old olive trees (over 50 years old), which have not been renewed in the last decades. Farming is essentially limited to the management of the trees and the soil, as well as some management of the surface water drainage (i.e., maintenance of the terraced system). In particular, annual practices are fertilization and pest control, the control of grassy undergrowth, pruning and the burning of pruning residues and harvesting. Olive cropping on terraced land is not suitable to mechanization, thus resulting as highly labor-demanding. The agricultural equipment is generally limited to handheld facilitators and shakers for the harvest, as well as brush cutters/trimmers for the grass cuts and chainsaws for some pruning. Half of the surveyed hobby farmers use organic fertilization (Table 7). Hobby farmers who use chemical fertilizers declared to apply between 0.3 and 2.2 kg nitrogen/tree, roughly corresponding to a total quantity of 125 and 1000 kg/year. Only two hobby farmers declared to apply 3.3 and 5.6 kg nitrogen/tree. The hobby farmers generally affirmed trying to reduce their production costs, so the application of chemical fertilizers is decreasing. Two respondents said that they stopped fertilizing, as they did not want to have more olives to harvest, whereas about 29% of the land managers do not use any fertilizers at all. Production is for family use, and hobby farmers prefer to produce as naturally as possible, generally not paying importance to the quantity of produced oil but to the quality.

Concerning pest management, the major part of the hobby farmers prefer not to intervene at all with traps or chemical agents against the olive fruit fly *Bactrocera oleae* (Diptera: Tephritidae), the most important pest for olive production for the Calci Municipality. The usually adopted reaction on a massive presence of the olive fruit fly is an earlier harvesting to reduce the damage. All actually known measures to fight the olive fruit fly require economic investments and often are not taken into consideration because of several reasons: the effective defense needs a common action of the whole neighborhood, because only covering a contiguous area without interruptions may the fruit

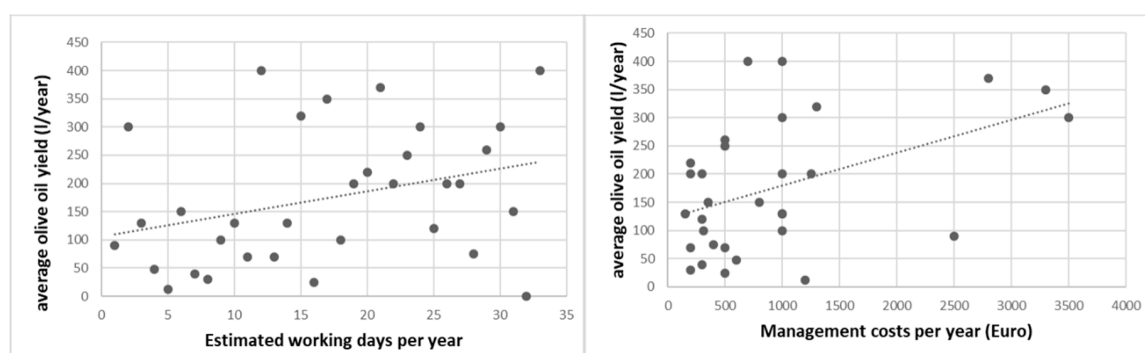
fly be reduced or controlled in that area. It is nearly impossible to make a whole mostly fragmented neighborhood agree on a shared defense action that implies a specific cost. Secondly, some have discovered that the effectiveness of the actions is not always significant and so prefer to hope for a low fly density for the season rather than worry about the actions to take. The olive fruit fly is seen as an important problem by all hobby farmers but is treated like a natural hazard that you are not able to fight adequately. Only three hobby farmers (9% of the surveyed sample) use chemicals such as dimethoate.

Most hobby farmers perform pruning yearly or every two years (Table 8). Those who do pruning every year manage grounds with a number of trees ranging from 45 to 300, with an average value of 140 managed trees. Surely, the number of managed trees is a limitation for the pruning frequency: hobby farmers with more than 300 trees are not able to do pruning on all trees every year, so will rotate within the frame of two or three years. Eighty percent of the hobby farmers burn the pruning residues on the grounds, applying the normative rules released by the local administration (formal request, restrictions on duration, period and distances to trees). This is connected also to the risk of fire in the area, as reported by several local actors (personal communication). Twenty percent have found alternative solutions that are less impacting on the air quality and energy consumption: from carrying all to their homes and burning in the stove or oven, overproducing bio-char or chopping them finely to leave as fertilizer on the grounds.

Half of the hobby farmers sample cuts the grass just one a year (Table 8), usually in the summer when the fire risk is high and recommendations for grass cutting are explicitly forwarded by the local administration. The reduction of grass cuts per year (many interviewees stated that, in former times, they cut more frequently) is partly because of new improved nets that are good also on high vegetation, as well as for saving on manpower and machine input. The estimated management costs for the olive groves range from 150 to 3500 €/year (Table 8). They comprise: expenses for fertilizers; pest control; machine oil for facilitators; shakers and brush trimmers; gasoline for the travel to and from the olive grove; expenses for the oil processing (oil mill) and payment of external labor for pruning, grass cutting or harvest.

### 3.2.4. Analysis of the Management Costs of the Hobby Farms

There is no significant correlation (0.46) between management costs and yield per year. The highest yields are performed with an investment of not more than 1000 €/year (Figure 6). Most hobby farmers invest up to 1300 €/year for the management of their olive grove, with important variations of yield between them.



**Figure 6.** Correlation of management costs and yield (left) and between labor input and yield (right).

Hobby farmers invest the time they are able and willing to into their farming activity. The input of labor is not correlated to the yield: the outcome of the farming activity in terms of the high production of olive oil is not a key motivation in hobby farming. Seven hobby farmers pay external labor craft

for grass cutting, pruning or harvesting. Payment often is made “in nature” by quantities of olive oil, so might not have been considered in the management expenses.

### 3.2.5. Dry Stone Walls Maintenance

Maintenance of dry stone walls is very cost and labor-intensive [35] and requires specific skills that are likely to be lost, as only a few, mostly aged people still are able to do this artisan handwork. This maintenance can hardly be carried out successfully by unskilled people. Fifty-six percent of the hobby farmers declare to do, or to have done in the past, maintenance of dry stone walls: nearly all of them try by themselves, with help and/or instructions by neighbors or professionals, while only 37% declare to have the work carried out by professionals, often financed by regional requalification projects. Recently, with the recognition of UNESCO of the art of dry stone walling as intangible cultural heritage in 2019, interest in dry stone walling has increased, and courses are offered on the regional and national levels (e.g., ITLA Italia, <http://www.paesaggiterrazzati.it/news/>). The foundation of an Italian Dry Stone School is evidence for this interest.

### 3.2.6. Motivations and Constraints for Managing Olive Groves

The main perceived motivation by the hobby farmers is simple passion in its original sense: loving to do something that also makes you suffer. Caretaking. This motivation is shared by 83% of the hobby farmers, indicated as the first and most important motivation (Figure 7), independently of whether they had just started or been active for generations in their family. It was not in the list of the answer options present on the questionnaire.



**Figure 7.** (left) Motivations for hobby farming in the surveyed sample ( $n = 35$ ). (right) Constraints for the olive grove hobby farmer samples ( $n = 35$ ); % refers to the total per item.

It was a multiple answer question, so the other motivations most often identify the secondary motivations as production of olive oil for self-consumption, a strongly felt responsibility for the maintenance of the traditional landscape (stewardship) and tradition-keeping (often indicated by hobby farmers that have inherited their olive groves), as well as healthy activities in the open (physical fitness) and, lastly, also an investment (11% mentioned this motivation).

The hobby farmers feel themselves to be maintaining the traditional cultural landscape, as well as, to a minor degree, biodiversity and the hydrologic system.

The constraints can be classified in olive grove management intrinsic technical constraints as olive diseases, pests and labor availability and costs and, on the other side, locally specific constraints of the property features as neighborhood intrinsic problems like the administrative restrictions for building sheds, as well as accessibility and morphology, or the presence of wild boars.

The most importantly perceived constraints were the wild boars that destroy dry stone walls and terraces (74%), a common issue in Mediterranean landscapes. The threat of the olive fruit fly was a problem to more than half of the samples (57%). Diseases of the olive trees are seen by 29% of the



hobby farmers as a problem to cope with. For 29% of the hobby farmers, accessibility of the olive grove is a problem: most olive groves are accessible by car just from one side, and this can be a problem particularly in the harvesting period for carrying the heavy olive boxes to the car. Another problem perceived by 20% of the sample was the “labor craft”, to be intended as the high cost and limited availability of skilled operators. However, most of the hobby farmers do not perceive the labor input as a problem, as they define it as a matter of fact intrinsic to olive farming on terraced grounds. Hobby farmers that need to refer to external help in pruning or harvesting have a different perception than hobby farmers that are used to doing all necessary practices by themselves.

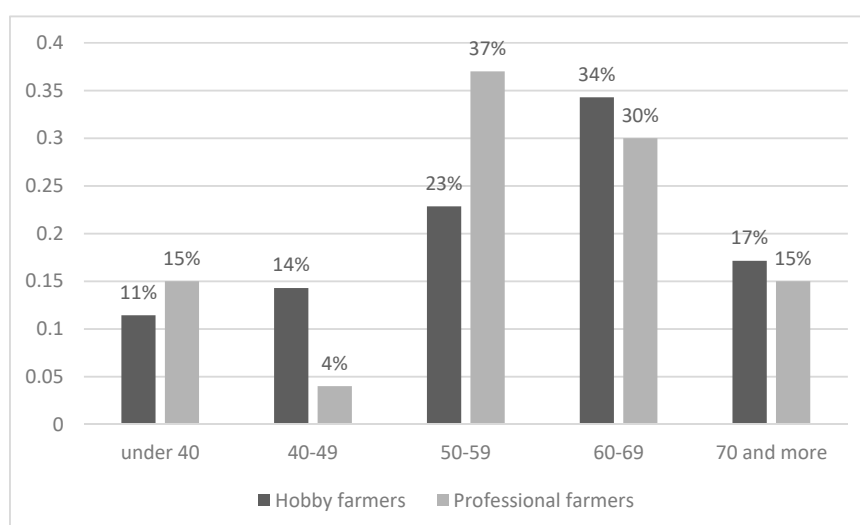
The property features, a problem for 23%, include the neighborhood relations and, herein, often abandonment with all its consequences (57% confirm there are abandoned areas close to their olive groves) but, also, the restrictions for building new tool sheds necessary to store the shakers, cutters and chainsaws.

### 3.2.7. Comparison between Hobby and Professional Olive Farmers in Calci

From previous studies [16], we could rely on the data acquired by five interviews to professional olive farmers in Calci and have compared the available variables with the hobby farmer samples. At least two of the professional farmers are confirmed as in the grey zone between hobby and professional farming: both state themselves as hobby farmers, but they are registered as farm businesses (see Section 4). We suppose that there are also other professional farmers that have similar characteristics. These professional farmers are registered in the Chamber of Commerce of Pisa Province, but none of them relies exclusively on olive groves for his or her farm business; all have multifunctional farms (mostly with agritourist functions). They often offer also maintenance services for the local administration and for private subjects, as pruning or terrace restoring, to integrate their incomes. Some work as consultants to other farmers.

Who are the professional farmers? Half of the professional olive farms in the Calci Municipality are managed by women: 14 of 28 farmers are female. In the sample of five professional farmers that were interviewed (19% of the professional farmers), three of five were female. The age structure of these farmers showed a dominance of the group of 50–70 years old (Figure 8), but there were new farmers coming up, the class of under 40 years old. The average age was 56 years. Half of the farmers received subsidies from the Common Agricultural Policy between 2008 and 2015, while the other half was not interested in the high amount of bureaucracy for limited financial support. The average olive farmer at Calci started about 13 years ago with his activity. Only two have started more than 30 years ago, while 10 began during the last decade. So there seems to be a kind of renewal of professional olive farming that might result in a countertendency to the closure of 50% of the professional farms (concerning all sectors of agriculture) in Pisa Province between 2000 and 2010 (Pisa statistics, Pisa, 2010 No. 7.174; 2000 No. 14.473-7.299-5, 0.4%, StatProvPi).

We analyzed the interviews of five professional farmers (17% of the total of 28 professional olive farmers of Calci) in relation to the 35 interviews with hobby farmers (Table 9). The major differences between the hobby and professional farmers lies in the size of the managed olive groves and in the amount of produced olive oil. Professional farmers sell their olive oil with certified labels, while the hobby farmers produce mainly for self-consumption and sell just a small part, mostly through informal channels (friends, neighbors, etc.). The hobby farmers have no costs for labeling, quality controls and taxes, as the professional farmers do. This is seen as an illegal concurrence with the professional farmers and results in a conflict potential.



**Figure 8.** Age classes (years) of the hobby farmers (n = 35) and the professional farmers (n = 28).

**Table 9.** Comparison of variables and mean variables between hobby and professional farmers; ns indicates  $p > 0.05$  = nonsignificant. \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ ; (cv) indicates the coefficient of variation.

Variables	Hobby	Professional	p-Value
Number	35	5	
Education level	48% University, 14% high school, 23% middle school, 9% elementary school	40% university, 40% high school, 20% NA	ns
Average age in years (cv)	57 (0.20)	52 (0.27)	ns
Retired (% on group)	48%	none	**
Average olive grove size in ha (cv)	0.86 (0.98)	5.92 (0.79)	***
Average number of trees (cv)	337 (1.19)	2.600 (0.84)	***
Years since when managing	>20 (45%) <10 (31%)	>20 (40%) <10 (40%)	ns
Average olive oil production in liters (cv)	176.18 (0.67)	730.00 (0.48)	ns
Average olive oil production per tree in liters (cv)	0.72 (0.67)	0.45 (0.68)	ns
Olive oil sold (% on individual prod.)	10% *	50–95%	***
Average working days per year (cv)	67.77 (0.54)	NA	ns
Dry stone walls maintenance (% per group)	54%	40%	ns
Average number of grass cuts per year (cv)	1.86 (0.49)	1.2 (0.25)	ns
Average management costs per year in Euro (cv)	898.79 (0.98)	NA	NA
Use of chem. fertilizers (% per group)	37%	0 (all organic)	ns
Pest control, i.e., olive fruit fly (% per group)	43%	60%	ns
Burning of pruning residues on the ground (% per group)	80%	80%	ns
Residence on grove (% per group)	43%	80%	ns

\* Only 23% of the hobby farmers sell part of their olive oil.

The five interviewed professional farmers are distinguished from the nonprofessional farmers mostly by acreage of managed land and number of managed olive trees, as well as amount of produced olive oil. The tree number varies from 800 to 5000 trees. However, they do not differ in productivity: the average produced oil per tree is low (0.46 L/tree), as not all trees are harvested what would be asking too-high of a labor input for what they can or want to afford (oral communication by one of the interviewed farmers). The total produced quantity of olive oil varies between 400 and 1200 L/year. These quantities do not allow a subsistence from farming. All farms are organic or integrated production, not using chemical fertilizers (and some, even no organic fertilization). The professional farmers are only in part engaged with fighting the olive fruit fly (three out of five),

and the maintenance of dry stone walls that stabilize the terrace system is not a priority. The grass cuts are performed less frequently by the professional farmers than by the hobby farmers. This is related to the different sizes of the olive groves. Burning the pruning residues on the grounds is as frequently practiced as by the hobby farmers (80%).

According to the professional and hobby farmers of Calci, the value of the local olive oil, if economically sustainable for the producer, should have a selling price of 15–20 €/L. However, the real prices range from 8 to 18 €/L, depending on the quality (organic or otherwise certified, e.g., denomination of origin or less), the marketing abilities and contacts of the seller. If we consider the minimum price, 8 €/L, to calculate the savings a hobby farmer obtains by not being forced to buy olive oil for self-consumption, only eight hobby farmers (23%) invest more in terms of money than they obtain in olive oil value.

## 4. Discussion

### 4.1. Limits of the Method

We designed a reproducible method for a database construction where no or few official data are available. The creation of a new database has encountered several problems: apart from the receipt of the list of associates of the local oil mill, we had difficulties in accessing personal data important for our study due to the privacy policy rules. For research purposes and under exclusion of the data use in any other circumstances, we had visual access to the requests for burning the pruning residues of the municipality and filled in the names and ages of the requesting persons, both managers and owners of land, in our database.

We realized after the interviews that there is a continuum between hobby farmers and professional farmers, particularly on small farms that can be olive grove farms, and this is consistent with the results of the authors of [43] on small farming in Europe. This continuum can suggest for further research to take into account all the land managers, instead of just one type, hobby or professional.

Concerning the interviews, some economic variables were difficult to get. In fact, all the surveyed hobby farmers had difficulties indicating a medium annual harvest, as the oscillations from one year to another are high, and this is not their main focus. The estimation of yearly management costs was quite arbitrary, and we might have had to give stricter inputs on how to calculate them.

Finally, the sample of the 35 surveyed hobby farmers is quite small, covering 12% of the censused hobby farmers, but large enough to identify common issues and practices for these land managers that can be useful in designing further research on how to support sustainable land management in the area.

### 4.2. Discussion of the Results

The aim of the study was to discover the real dimension of hobby farming on a local level and to design a picture of the hobby farmers managing olive groves in a peri-urban area in the Mediterranean, so as to analyze their impact on the landscape, on society and the economy. Is hobby farming sustainable in the long term?

We have illustrated the numerical and spatial importances of hobby farmers in the study area. This was hypothesized by stakeholders and in the literature [13,32] but has not been confirmed by a detailed census yet, as the data acquisition is not immediate. To our knowledge, this is the first in-depth study on a local community of hobby farmers in Italy.

The main destination of the olive oil is family consumption. It can be estimated (personal communication from several hobby farmers) that a four-person household consumes about 50 L of olive oil a year. There are just four hobby farmers that produce less (0–30 L), but three of them could easily produce more, as they all manage between 200 and 250 trees each. Therefore, it is their personal choice to produce just small quantities of oil. The phenomenon of hobby farming on terraced slopes is particularly developed in peri-urban and well-connected and/or attractive touristic areas. By comparing hobby farmers and professional farmers managing olive groves in Calci, we demonstrated that there

seems to be no significant differences in farming practices between hobby and professional farmers, being the latter ones mostly organic farmers and all farms low-input on no-tillage and no-irrigation olive groves.

The difference in Italy between professional (full-time and part-time) farmers and hobby farmers is not easily capable. The agricultural system known from the official statistics is characterized by numerous very small farms, often not economically sustainable. Arzeni and Sotte [44] stated that 36% of the farms in Italy produce merely for self-consumption, calling them “nonenterprise farms”. Most of these very small farms (84%) are permanent cultures as vineyards and olive groves. The Italian agricultural system is based on small farms; in 2010, 67% of all Italian farms had an income of less than 10,000 € each [44]. Probably, a lot of small professional farms that produce just for self-consumption will not appear anymore in the next census as farms. The new adoption of the Common Agriculture Policy measures on the regional level has raised the minimum acreage of land necessary to apply for the subsidies to one hectare of useable agricultural area (UAA). With the loss of—even very low—payments for olive oil production or ecosystem services, these farms might be threatened by abandonment.

We do not believe that the age structure of farmers implies the risk of abandonment, as our study shows that there has always been a renewal (from the 1970s to current), and there is a growing movement “back to the land”, mostly in well-connected areas. In our sample, there is a trend of increasing acquisitions of hobby farms during the last 30 years. Hobby farming is maybe a still underestimated phenomenon that has—as agriculture in general—an important role in the landscape stewardship and land system dynamics.

#### 4.3. Sustainability of Hobby Farms

The most sensitive groups of farming practices on olive groves are the soil management, irrigation, fertilization and pest management [45] but, also, the management of terraces and of the hydrogeological system. The results of our surveys in the municipality of Calci are consistent with recent literature on sustainable olive grove management [46,47], both for biodiversity conservation, soil conservation and low input fertilization and pest control.

Olive cultivation on Monte Pisano is hardly profit-providing, even for professional farms with at least 1000 trees. Hobby farmers at Calci spend about 1000 € per year for the olive grove, but they have also the output of olive oil (not guaranteed yearly due to a very high variability). Compared to studies on other olive groves in the Mediterranean, managed mostly by professional olive farmers, on Calci’s olive groves, the potential productivity of olive trees per ha is low. In our case study, the mean yield of olives is an average of 2050 kg/ha (2200 L/ha), ranging from 120 to one exceptional case of 6500 kg/ha. In a Spanish case study in Andalusia [45], the average yield was 4000–6000 kg olives/ha with a minor tree density; another case study of the same region [28] defined olive groves with a low density per ha, ca. 90 trees per ha, compared to an average of 430 trees/ha at Calci, with a yield of 1450 kg olives/ha and 300 kg/ha of produced oil. To compare more effectively the harvests of the different case studies, we have calculated the average oil produced per tree (Table 10). In terms of production, surely there are margins for the case study farmers. In all the other case studies, for the calculation of the yield, there is no distinction between hobby and professional farmers. The particular situation of the Calci olive groves is evident: the tree density is extremely high, and the yield very low. In part, this can be attributed to the fact that harvesting often is not performed on all trees.

Several positive effects of hobby farmers on the social scale are evident: firstly, the maintenance of the otherwise abandoned land and the repopulation of the countryside and village and the loss of the cultural value of the traditional landscape characterizing olive groves is avoided. Hobby farmers maintain cultural values such as traditional harvesting methods as a family tradition. Other positive effects of the presence of hobby farmers can be cited, such as the protection of human settlements through fire prevention and flood prevention. Uniformed management guidelines for the olive groves are needed to obtain benefits for all farmers. Additionally, the fact that nearly half of the hobby farmers and, also, many professional farmers do not perform any maintenance measures to

preserve the landscape by restoring terraces and ensuring their proper functioning should interest local decision-makers who are concerned with slope stability and natural hazards and risk management. The presence and management of the olive groves do not imply automatically the maintenance of the infrastructures vital for the stability of this fragile hydrogeological system.

**Table 10.** Comparison of several production performances in Mediterranean traditional olive groves.

	Year of Publication	Study Area	Slope Characteristics	Tree Density	Harvested Olives	Oil Yield	Oil yield per Tree
Moragues-Faus (ES)	2014	Alto Palencia, Valencia	partly terraced	78–100 trees/ha	1440 kg/ha	ca. 300 kg/ha	ca. 3 kg/tree
Carmona-Torres et al. (ES)	2014	Andalusia	partly on steep slopes		4000–6000 kg/ha		
Duarte et al. (ES, GR, IT, PT)	2008	SMOPS in 4 Mediterranean countries	moderate-steep slopes, mostly on terraced grounds	50–150 trees/ha	800–2100 kg/ha	200–400 kg/ha	ca. 3 kg/tree
Michalopoulos et al. (GR)	2020	Greece	slopy areas	150–200 trees/ha		800 kg/ha	>4 kg/tree
Torquati et al. (IT)	2017	Trevi, Umbria	mostly terraced slopes	100–400 trees/ha			1.4 kg/tree
Our case study (IT)	2020	Calci, Pisa province	terraced slopes	200–700 trees/ha (430)	2050 kg/ha	ca.280 kg/ha	0.66 kg/tree
di Iacovo (IT)	1989	Calci and Monte Pisano	terraced slopes	ca. 400 trees/ha	ca. 2000 kg/ha	ca. 420 kg/ha	ca. 1 kg/tree

Liters of olive oil = (kg of olive oil)/0.92.

To make the land management practices more sustainable and effective, a common strategy would be important. There are first attempts to build a common awareness on this and other problems related to olive cropping on the terraced grounds at Calci by an association of mostly hobby farmers that, in 2018, started to give advice by local experts on agroecological approaches and solutions to anyone interested by guaranteeing, with support of the mayor, the opening of an information counter once a month. Furthermore, the “Sportello di Agroecologia” organizes seminars on the management and conservation issues of these olive groves, as well as special courses on dry stone wall restoring and pruning. Therefore, there is also a strong social aspect: hobby farming is and can be a unifying activity.

The permanence of olive growers on Monte Pisano is desirable and important for the maintenance of this land system and perceived as typical and landscape-determinant in this area. Considering the small size of the properties, our thesis is that, for highly specialized and dense olive groves on steep slopes, there is actually no alternative of management to the family management of the olive groves, as the invested labor is major to the economic output. Examples of recovery of abandoned lands in Northern Italy [48] by families, groups of friends and associations confirm this thesis.

## 5. Conclusions

We have presented a case study on the land management in a particular Mediterranean land system characterized by permanent olive groves on sloping areas, revealing that most of the land managers are hobby farmers. The results call for enhancing the capacity to learn from these unofficial farmers. Eventually, this also questions the sustainability in the long term of this land system typical of Mediterranean areas. We surprisingly highlighted that, among the land managers, hobby farmers have quite comparable low-input farming practices to professional olive farmers but differ for the amount and marketing of their olives, which are mainly oriented to self and family consumption. Besides the monographic interest of our study, our results confirm the need to unravel the roles of these hidden land managers, which are currently poorly or not targeted by policy-makers, neither for their land management practices nor for their food production practices.

**Supplementary Materials:** The full questionnaire is available at <https://doi.org/10.6084/m9.figshare.12210023>.

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