Article

Characterisation of Organic Olive Farmers in the Framework of M11 of the Common Agricultural Policy

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Abstract: During the last decade, Common Agricultural Policy (CAP) has prioritised measures focused on sustainability and quality over production. The purpose of the AGRICORE project is to develop a tool based on agent-based modelling to assist policymakers in the design of improved policies. The present study belongs to a use case of this project that measures the environmental and climate impact of Measure 11—Organic agriculture—from the 2014–2020 Rural Development Programme of the Andalusian olive sector. As part of this study, a survey campaign was conducted, which collected data from 189 organic olive farmers in Andalusia. The data were analysed in order to characterise organic olive farmers and their farms. This paper presents the resulting characterisation, covering some information gaps detected as part of the AGRICORE project, such as their acceptance of M11 and willingness to innovate and take risks. The results highlight that most of the respondents are unaware of important aspects, such as exploitation costs and their belonging to environmentally protected areas. Furthermore, it is interesting to note that most farmers are approximately 60 years old, and more than 35% are women. Furthermore, most of those studied do not intend to return to conventional production methods. These results help to provide a current perspective of the organic olive sector in Andalusia, which can be used by policymakers to design improved policies that entail an increase in organic olive production.

Keywords: Common Agricultural Policy; olive sector; organic farming; conventional farming

1. Introduction

Andalusia is one of the most important agricultural regions in Spain and also within Europe. Spanning 87,597 km^2 and a population of 8.4 million people, it is the fourth largest region in the EU-28. Agriculture is key to the region, accounting for 9280 million euros of Gross Value Added (GVA) and employing 268,000 people. Andalusia is the world's leading producer of olive oil, with 1.5 million hectares of surface area dedicated to the production of 1.1 million tonnes of product per year (Figure 1). The region is considered a transition region according to the 2014/99/EU directive. Production from the 2020–2021 campaign was around 6.5 million tonnes of olives for milling, which generated more than 1.3 million tonnes of olive oil. These results were 50% higher than the previous campaign and 22.5%

higher than the average of the prior five campaigns [1]. Figure 2 shows the evolution of olive oil production in the last nine agricultural seasons, illustrating the importance of the sector.
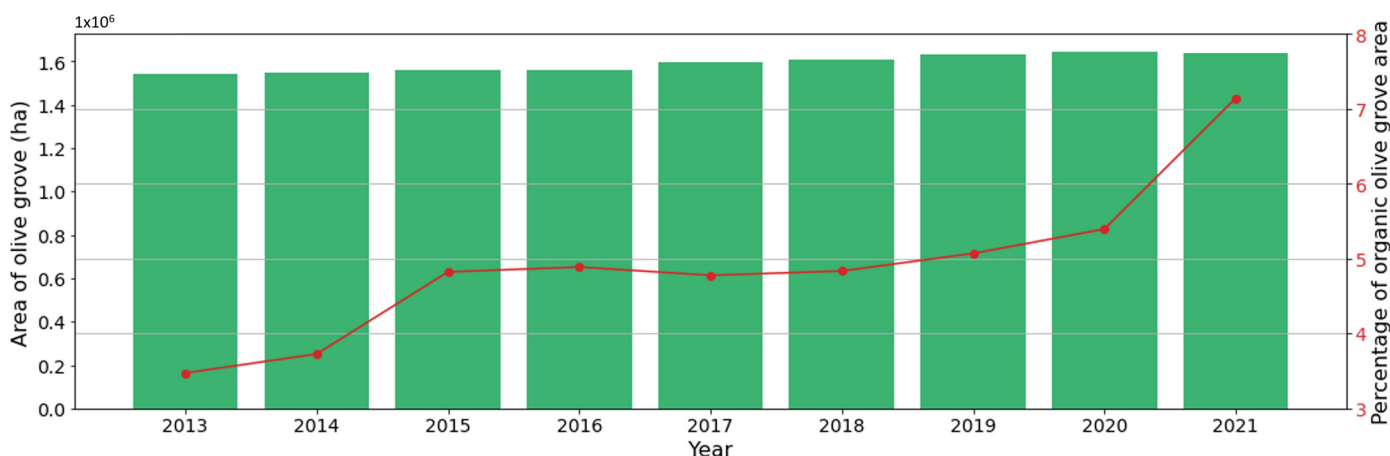
Figure 1. Evolution of the olive grove, including the percentage of organic olive grove area.
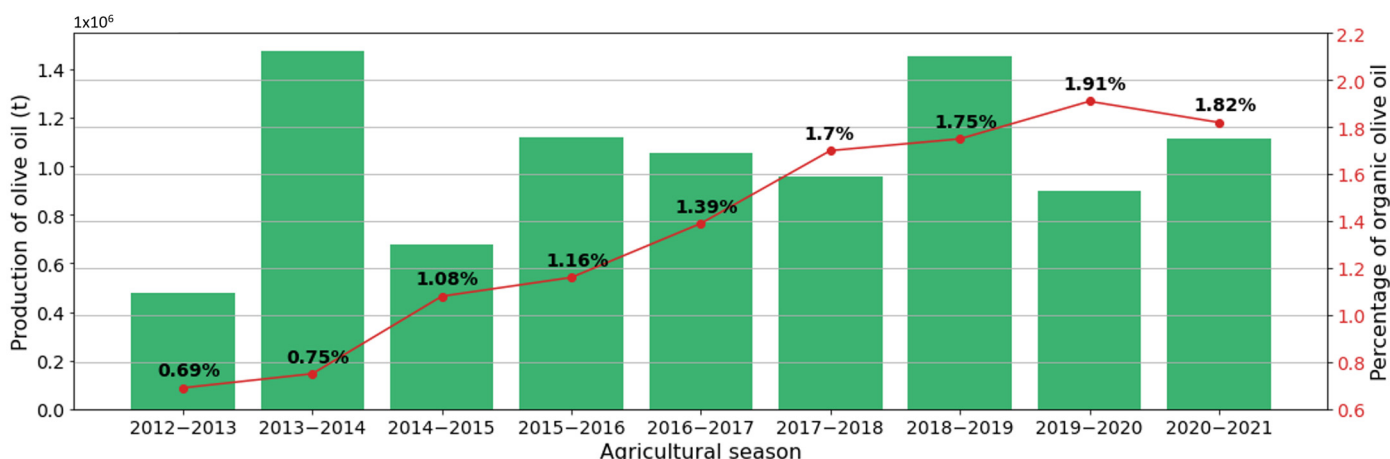
Figure 2. Trend of olive oil production, including the percentage of organic olive oil.

Public authorities recognise that olives are a strategic crop and the most representative and symbolic crop for the Andalusian community. It is an agrosystem of significant economic, social, environmental and cultural importance [2]. In Andalusia, olive cultivation represents approximately 26% of Agricultural Production (31% of Vegetable Production), placing it as the second highest agricultural sector in economic importance [3]. In addition, it is also the sector that generates the most agricultural employment (32% of the agricultural workforce), which has earned it the nickname of "social crop" [2]. It is the main activity of more than 300 Andalusian villages, in which more than 250,000 families work and live [4–6]. Furthermore, as demonstrated by its various functions, olive cultivation has a high environmental value, such as the provision of public goods, maintenance of the rural population and surveillance of the territory; it and can become a reference within the agricultural sector in the fight against climate change, for example, by fixing significant amounts of carbon dioxide (CO_2). Its role as a sink for greenhouse gases and its potential for generating renewable energies should also be mentioned [4]. Indeed, all these beneficial aspects of olive farming are included and supported by the Law of Olive Farming of Andalusia [7].

Regarding organic olive groves, its area is steadily increasing and now represents more than 5% of the total production area in Andalusia (Figure 1). The production of organic olive oil in the 2019–2020 campaign amounted to 17,000 tonnes. The percentage of organic

olive oil production compared to total oil production has continued to grow since 2011, even during seasons that have experienced a reduction in production (2012/13, 2014/15 and 2019/20). For example, this percentage has always remained higher than the previous season, rising from just over half a percentage point to almost 2% [1] (Figure 2).

Sectoral policies promote a profitable, efficient, competitive and sustainable olive grove. Thanks to agricultural policies at the EU and national levels, the sector has been boosted, increasing the quality [8] and production of olive oil [9]. In economic terms, 94% of Andalusian olive grove holdings receive economic aid from agricultural policies, with the highest average amount per holding (3925€) [10]. The new plantations focused on spatial and temporal productivity and the mechanisation of harvesting, combined with the irrigation of traditional olive groves, are the key reasons for the notable increase in olive production (see Figure 2). To continue this trend, policy actions and instruments for the permanent modernisation of the sector are required to ensure the development of research, innovation and training; the promotion of quality for both health and consumption; the structuring of the sector in efficient interprofessional associations and the promotion of well-integrated and appropriately sized marketing structures [11]. In this context, the AGRICORE project aims to collaborate with the development of a tool that assists policymakers in the design of improved agricultural policies thanks to the simulation of an agent-based model (ABM).

This article is based on the data obtained within the AGRICORE project, a project that assesses the environmental and climate impact of agricultural policies under the framework of the Common Agricultural Policy (CAP). Specifically, CAP Measure 11 (M11)—Organic agriculture—has been the instrument selected in this study for the 2014–2020 period [12,13]. This AGRICORE use case has analysed the influence of M11 on the Andalusian olive sector, focusing on its environmental and climate impacts. To achieve this, an ABM has been developed, and in order to initialise it and test its performance, it was necessary to collect data through participatory research among policymakers, supervisory bodies, farmers and agricultural associations.

Previous studies have already analysed the characteristics of organic olive farms and the factors that drove farmers to make the transition [14,15]. These studies showed that organic olive groves, compared to conventional olive groves, have lower productivity and require more time and effort. In addition, organic olive farmers are generally younger and less experienced but more educated and are opposed to the use of chemicals. These conclusions drawn from previous studies were taken as a starting hypothesis to check whether the profile of the organic olive farmer is still the same years later or whether it has been affected mainly by CAP M11.

This paper presents the results of participatory research carried out in the Andalusian Use Case of the AGRICORE project. To this end, the methodology used was based on data collection through survey campaigns, which have been used in similar studies [16–18]. The questionnaires used to collect the data were also based on the questionnaire designed by Parra-López [14,15]. In this case, this methodology approach was also chosen because it was the only way to collect novel information, which does not appear in public datasets, from a specific population. The target population was limited geographically and temporally, that is, farmers in Andalusia who converted to organic olive farming between 2014 and 2017. Furthermore, the sample population was classified according to the type of olive grove to obtain a more complete image of organic olive farming in Andalusia.

This study has two main objectives. On the one hand, within the framework of the AGRICORE project, the study aims to obtain relevant information to initialise the model developed in that project, thus covering information gaps that have been detected. On the other hand, in terms of research, this study aims to produce an updated characterisation of organic olive groves in Andalusia. This will allow for verifying the validation of the initial hypotheses, confirming their current validity. Moreover, although it is outside the main objectives of the paper, it should be noted that a slight comparison between organic and conventional olive farmers has been done, which may lead to future studies.

Role of Agricultural Policies in Andalusian Olive Farming

Numerous studies and the latest CAP reforms confirm that there is a general social demand for agriculture, the olive grove in particular, to generate public goods and services, which are important for farmers and rural and urban society alike [7]. All of the stakeholders connected to the olive sector within a framework of collaboration established in the Master Plan for Olive Growing must promote actions aligned with that demand [4,7]. The European Agricultural Fund for Rural Development (EAFRD) is one of the five funds under the European Structural Investment Funds (ESI Funds) [19]. This fund finances the CAP's contribution to the EU's rural development objectives, contributing, among others, to Spain's strategic plan for the CAP [20].

Under the guidelines and limitations established in Regulation (EU) 1305/2013 of the European Parliament and of the Council, the corresponding Rural Development Programme for Andalusia (RDP) 2014–2020 and the National Rural Development Programme (NRDP) for the same period have been drawn up [21–23]. According to the importance of the olive sector, the Andalusian RDP includes the actions described in the Master Plan for Olive Growing through a specific sub-programme for olive groves. These actions are implemented through the aforementioned EAFRD fund.

Both programmes, RDP and NRDP, include M11: Organic Agriculture, which is the measure in which the project is framed. It focuses on support for organic production, centred on the promotion of environmentally friendly production systems. This aid supports a general system of agricultural management and food production that combines the best environmental practices and production in accordance with society's demand for products obtained from natural substances and processes. This measure contains two sub-measures related to the transition from conventional production systems to organic production systems (M11.1.2) and continual development for those organic operators (M11.2.2) who already choose to produce quality products covered by Regulation (EU) 2018/848 of the European Parliament and of the council on organic production and labelling of organic products [24]. M11 introduced in this regulation is intended to promote and stimulate the growth and consolidation of the organic sector, thus responding to the social demand to produce food in a natural way while respecting the environment. M11 aims to restore, preserve and enhance biodiversity, improve soil management and enhance water management [25].

2. Materials and Methods

2.1. Selection of the Subjects to Be Investigated

The sample of the target demographic must be a good reflection of Andalusia's organic olive producing industry. Considering the ex post analysis period (from 2014 to 2017) was the focus of the participatory research, the proposed survey was completed by 10% of olive producers who converted to organic cultivation during this time. This resulted in 189 surveys focused on organic olive cultivation. Additionally, according to other approaches [14,15], around 106 surveys were also conducted among conventional olive farmers in order to compare the results from both types of farming. However, it should be noted that this further analysis of conventional olive farmers is outside the scope of this paper.

The distinction created by the Master Plan for Olive Growing [4] was included as a criterion for selecting the sample in order to achieve results that were as representative as feasible. Six categories of olive exploitation may be identified as follows:

- Type 1: Low-yield olive orchard: the olive orchard yield is 775 kg of olives per hectare or less, or it is cultivated in zones with poor soil quality and climatic conditions or high slope zones.
- Type 2: High-slope olive orchard: the soil and climatic conditions are better than those of the previous type, but the land slope is equal to or more than 20%. As a result of the high slope, it is not possible to mechanise olive harvesting.

- Type 3: Extensive olive orchard with a density equal to or lower than 150 olive trees per hectare: the land slope is lower than 20%, and harvesting by mechanisation is possible.
- Type 4: Extensive olive orchard with medium density: the land slope is lower than 20%, and the planting density is between 150 and 180 olive trees per hectare.
- Type 5: Intensive olive orchard: the planting density is between 180 and 325 olive trees per hectare, and it is located in flatlands.
- Type 6: Super-intensive olive orchard: the planting density is higher than 325 olive trees per hectare, and it is located in flatlands.

The above classifications are used by the Andalusian regional government, and since they cover several olive grove characteristics, it was considered the most suitable for designing the distribution of the sample population. However, the last revision using these typologies was from 2009, so it was unable to perfectly reflect the current olive grove situation in Andalusia (see Table 1). Therefore, an attempt was made to estimate a similar classification with more updated data.

Table 1. Distribution of the Andalusian olive orchard area according to the types of exploitation defined in the Master Plan for Olive Growing [4].

Type	Irrigation Regime	Area (ha)	%
1	-	95,923	6.3
2	Non-irrigated	296,978	19.5
	Irrigated	57,537	3.8
3	Non-irrigated	472,006	31
	Irrigated	251,012	16.5
4	Non-irrigated	68,277	4.5
	Irrigated	45,353	3
5	Non-irrigated	90,264	5.9
	Irrigated	123,096	8.1
6	Non-irrigated	4989	0.3
	Irrigated	16,386	1.1
TOTAL OLIVE GROVE AREA		1,521,821	100

To perform this classification, the data available at the time of the sample design were used, i.e., SIGPAC [26] (from its Spanish naming, Geographical Information System for Agricultural Plots) and SIPEA [27] (from its Spanish naming, Information System for Organic Production in Andalusia). However, these databases did not include olive grove density, which was a necessary criterion for determining typology. To resolve this, slope and production data were used, and the average production of each olive grove typology was taken as a reference (see Table 2).

Table 2. Mean olive yield per type of exploitation based on [28].

Type	Mean Yield (kg/ha)	Estimated Mean Yield (kg/ha)
1	431	431
2	3356	3356
3	3967	4039.5
4	4112	
5	4832	5501.5
6	6171	

In regard to the above approach, some assumptions were required. First, since SIPEA data reflect the lack of high production ratios (intensive and super-intensive production) in organic olive farming, Types 5 and 6 were combined to increase representativeness in the sample population. Secondly, Types 3 and 4 were only differentiated by the tree density. Considering they only had a difference of about 30 trees per hectare, their average

production was very similar. Since differentiation between the two types based on the available data was very difficult, it was decided to combine them. Hence, the mean yields were also averaged (see final column of Table 2).

Based on the above, Table 3 was obtained. The organic olive exploitations in the ex post analysis period (2014–2017), including those in transition, were classified according to the type of olive grove. Moreover, information about area, production, yield and representativeness was included. The last two columns highlighted the number of farms in each type and the target surveys conducted, respectively. Therefore, this table described the target population.

Table 3. Summary of sample population features as grouped by type of exploitation.

Type	Area (ha)	Production (kg)	Yield (kg/ha)	% of Organic Olive Land	No Conversions	Surveys
1	45,093.4749	8,703,679	193.014	64.3%	1053	105
2	8288.3057	16,193,452	1953.771	11.8%	220	22
3–4	11,557.829	22,741,132	1967.595	16.5%	461	46
5–6	5196.3166	40,029,194	7703.378	7.4%	164	16

Finally, it should be noted that in order to achieve the target number of surveys for each type, those in charge of the survey campaign focused on agricultural regions where they had the greatest knowledge (i.e., they knew the type of olive grove predominant in that area). It should be clarified that in Andalusia, the agricultural regions are called OCAs (from the Spanish nomenclature of the Agricultural Regional Office), which are groupings of municipalities for administrative management purposes. Other criteria, such as homogeneity of surface area, population and agricultural resources and road communications of the municipalities, were also used [29].

2.2. Detection of Information Gaps to Design the Questionnaire

Thanks to the data provided by SIGPAC and SIPEA, it was possible to obtain the locations, areas and shapes of the organic and conventional olive farming parcels in Andalusia. However, some information gaps were detected that could have compromised the study. The information required to fill those gaps was therefore gathered through a survey campaign. The following information gaps were identified:

- Personal innovativeness: this feature shared by the farm owner and farm manager indicated the propensity to change the agricultural tools and methods in order to improve productivity and save time, effort and money. The development of innovations usually involves some risks because they may be associated with investments, complex techniques or lack of information.
- Risk aversion: similar to the previous feature, it was shared by the farm owner and farm manager. In this project, risk aversion was understood as the tendency of the farmer to invest in machinery, farmlands or innovations at the expense of incurring some debt. Therefore, risk aversion and personal innovativeness are significantly interlinked. This parameter was measured with lottery-choice [30] and multi-item scale questions.
- Coordinates and areas of the parcels: both parameters were closely related, and they were necessary to create a bank of parcels to generate the synthetic population.
- Biomass level: this variable referred to the management of pruning residue (branches and leaves). It was considered an innovative action that could reduce the costs of purchasing manure.
- Age: the age of the olive grove was a standard input for the biophysical models.
- Exploitation costs: since disaggregated data on the costs of olive exploitations were not sourced, it was necessary to collect these data to prepare and simulate the economic dimension of the holding.
- Belonging to an environmentally protected area: for benefiting from M11 economic support, agricultural holdings that belong to environmentally protected areas received

priority. These areas were Natura 2000 Network, a network of ecological protected areas in Europe; wetlands of international importance that fall under the RAMSAR designation (Convention on Wetlands of International Importance, especially as Waterfowl Habitats [31]) and "nitrogen vulnerable" areas, which were those territorial surfaces whose runoff or seepage influences from agricultural sources might contribute to nitrate contamination of water bodies.

2.3. Design of Questionnaires and Conduction of the Survey Campaigns to Carry out Participatory Research Activities

Considering the detected information gaps, the questionnaire used was designed based on previous research carried out by Dr. Carlos Parra-López from IFAPA (Institute for Agricultural and Fisheries Research and Training—using its Spanish acronym) [14,15]. That questionnaire was reduced and adapted to the needs of the AGRICORE use case. In addition, the qualitative questions were reformulated so they could be answered with data, and the dichotomous questions were changed to multiple choice. Finally, some additional questions that were considered important were formulated. Information regarding the farm locations was not included due to data protection reasons.

- In principle, the survey was designed to be completed over the phone and via telematics due to the COVID situation in 2020. This questionnaire version was used to conduct a pilot survey to a small percentage of the target population by phone. However, some problems were encountered during that process: the questionnaires were too extensive to answer by phone. It was necessary to adapt the format or the way of answering.
- Some questions needed visual support to be completely understood; otherwise, the interviewee might not have answered them or have given answers that distort the results.
- Many farmers were unaware of some of the asked data, such as the belonging to nature protection areas and the breakdown of the olive exploitation costs.
- To mitigate these problems, the following changes were therefore introduced:
- The questionnaire length was reduced.
- Surveys were conducted in person.
- For questions that farmers did not know the answers to, two mitigation actions were implemented. First, the pollster verified the answers to the question related to the farm belonging to protected natural areas because, as will be explained below, agricultural technicians know the areas extremely well. Second, in order to obtain the cost breakdown of the olive grove holdings, short questionnaires were sent to agricultural technicians within some cooperatives located in the region where the surveys were performed. In addition, information was extracted from previous studies in order to make an estimated breakdown. Finally, it should be noted that these questions were not removed from the questionnaire, as it was expected that some farmers would be able to answer them. As such, it was interesting to understand the percentage of farmers who were unable to respond to these questions.

After modifying the questionnaire with the feedback from the pilot survey, the data collection through the survey campaign started. It was conducted by OPRACOL, an association of olive farmers that works closely with Cooperativas Agro-alimentarias de Andalucía (CAAND) and the provincial agricultural technicians from CAAND. All were conducted in person to facilitate the responses, taking into account the predominant type of olive groves in each OCA (see Figure 3). The following procedure was followed for each questionnaire. First, the respondent was initially given a brief project description, its objectives and the purpose of the collected data. Furthermore, the respondent was informed that the survey was completely anonymous (first section of the questionnaire) and that the information collected would be used for the purposes highlighted in the grant agreement of the project. Once this information was read, if the person gave their consent to be surveyed, then the survey was carried out.
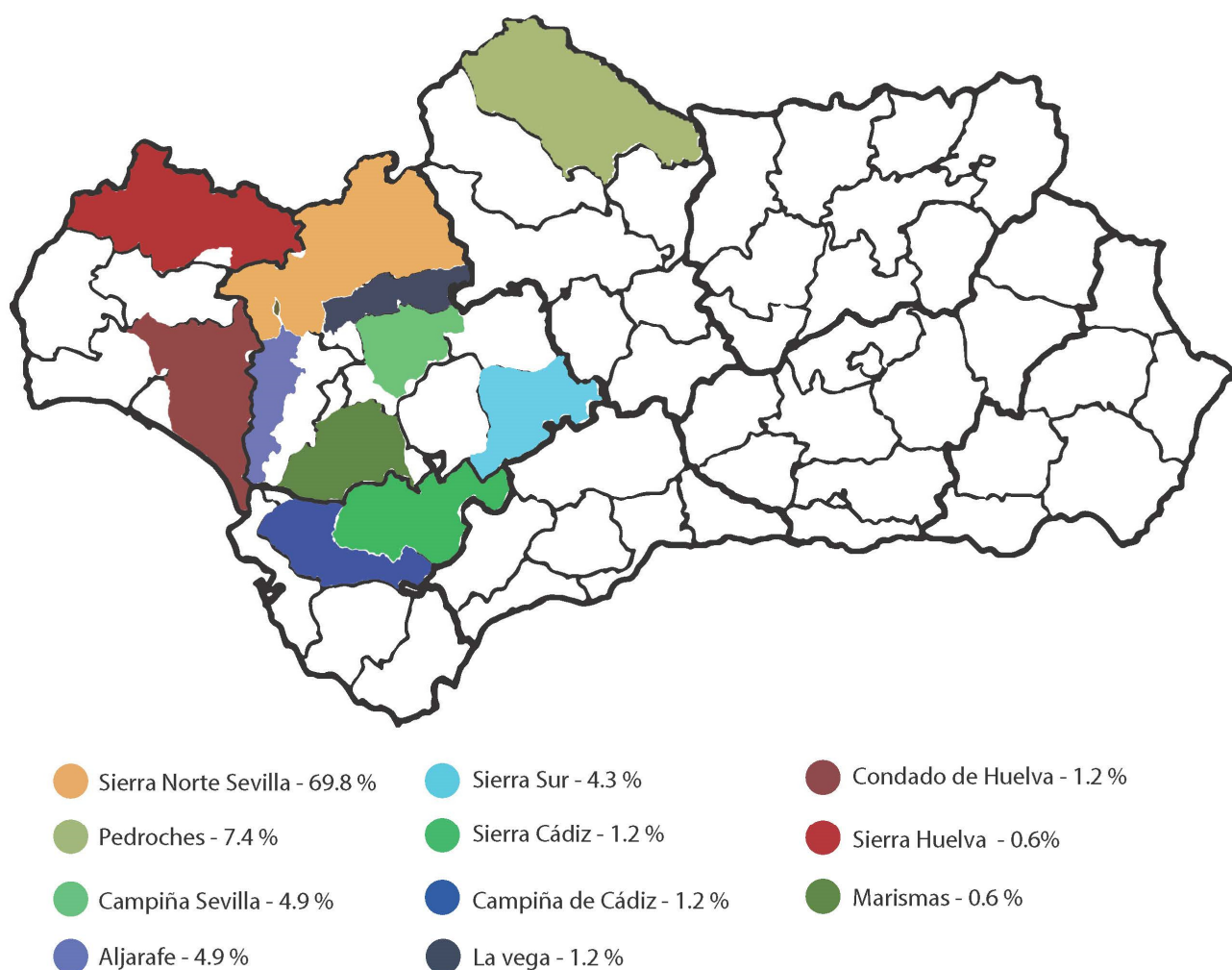
Sierra Norte Sevilla - 69.8 %

Pedroches - 7.4 %

Campiña Sevilla - 4.9 %

Aljarafe - 4.9 %

Sierra Sur - 4.3 %

Sierra Cádiz - 1.2 %

Campiña de Cádiz - 1.2 %

La vega - 1.2 %

Condado de Huelva - 1.2 %

Sierra Huelva - 0.6%

Marismas - 0.6 %

Figure 3. Distribution of surveys conducted by OCAs.

In parallel to the survey campaign, monitoring was also carried out during the 10-month survey campaign period, which included a monthly review with the technicians responsible for the action. Controls were carried out by telephone, and documentation was continuously received, allowing for preliminary analysis and detecting possible biases.

3. Results

The data analysis was carried out on the basis of all completed questions from all the questionnaires. The structure for analysing the results was based on collecting the information that was of most interest for completing the ABM modules of the AGRICORE tool. As a result, aspects such as personal data and position distribution, cultivated crop, production, acceptance of the measure, farmer's knowledge and innovation and risk aversion were considered.

3.1. Personal Data and Position Distribution

An important part of the study was to analyse which farmer's profile characteristics are currently dominant in the olive farming sector (Figure 4). As Figure 4a shows, the average farmer age is around 60–65 years old. Figure 4b also highlights that more than 35% of farmers are women. It was also noted in Figure 4c that only 30% of farmers have a tertiary educational level (i.e., university degree or postgraduate studies).
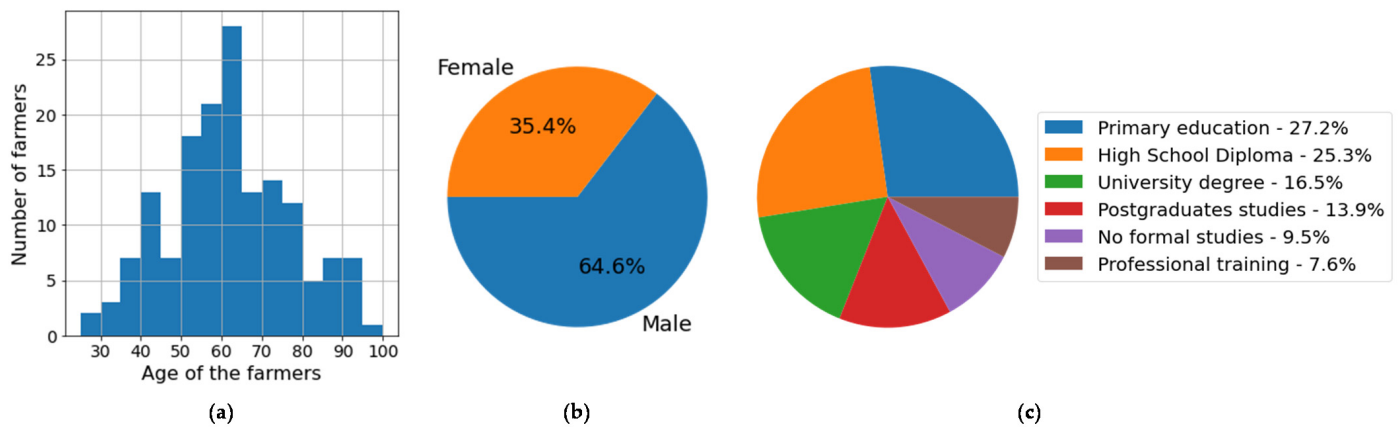
Figure 4. Graphical distribution of farmers: (**a**) Age distribution; (**b**) Gender distribution; (**c**) Educational level distribution.

In addition, farmers were analysed in terms of their position, work-related tasks and dedication to the farm (Figure 5). More than 80% of the respondents were farm owners (Figure 5a), more than 50% were involved in management/administration and technical farm work (Figure 5b) and only 15% of farmers devoted 100% of their economic activity to agriculture. The majority of farmers (around 60%) reported an annual dedication of only between 10 and 30% of their total annual workload (Figure 5c).
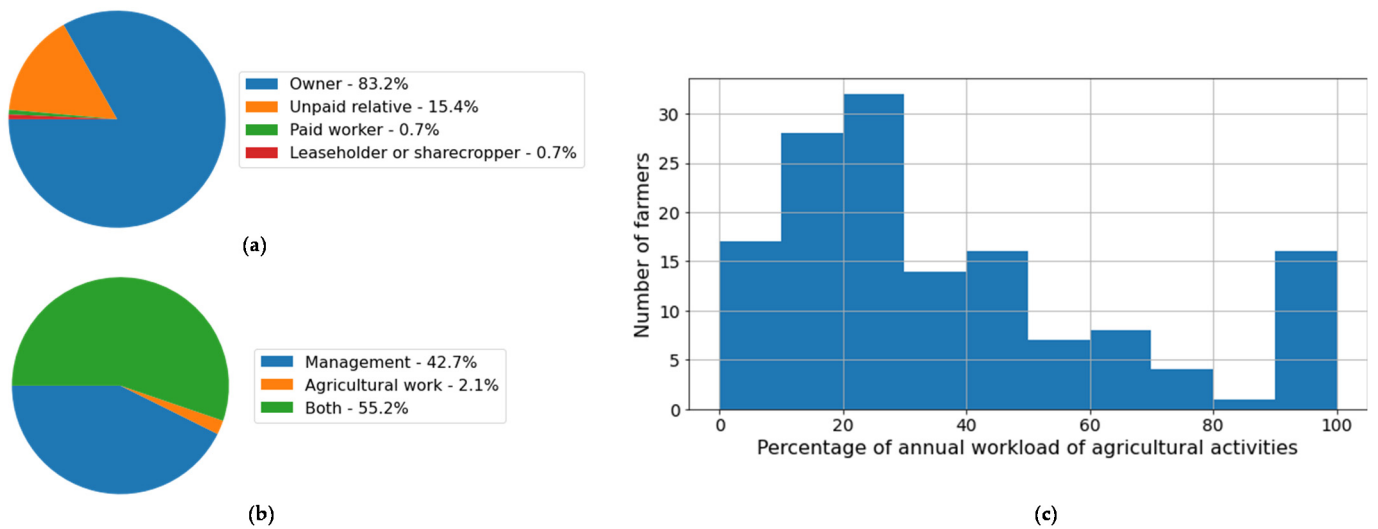

Figure 5. Graphical representation of the main characteristics of a farmer's position on the farm: (**a**) Position distribution; (**b**) Labour distribution; (**c**) Dedication to agricultural activities.

The study also analysed whether it is possible to predict generational replacement, and in fact, we observed a high percentage of this in the farms, or at least, they believe that it could exist, accounting for around 76% of the farms (Figure 6).
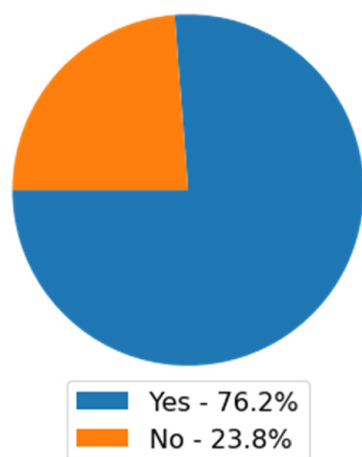
Figure 6. Generational replacement in organic olive grove farming.

3.2. Cultivated Crop

In order to know the situation of olive groves on the farms analysed, the different types of olive groves found on these farms have been identified (Figure 7). It should be noted that the filter of surveyed farmers has been extracted from SIPEA and that this platform only contains farmers practising organically or who are in transition. The farms under study had different characteristics from each other in terms of territory, with 74% exclusively dedicated to the production of organic olive groves (Figure 7a). They were also classified according to the specific characteristics that differentiate each typology, as explained in the previous section and 60% of the holdings analysed are divided between Type 1 and 2. The remaining 40% are divided (15% and 10%) between Type 3 and 4, respectively (Figure 7b), while there is a minority of intensive olive groves (Type 5 and 6). The distribution based on the real data is similar to what was expected to be obtained. Finally, it is noteworthy that 8% of the surveyed farmers do not know their type of olive exploitation.

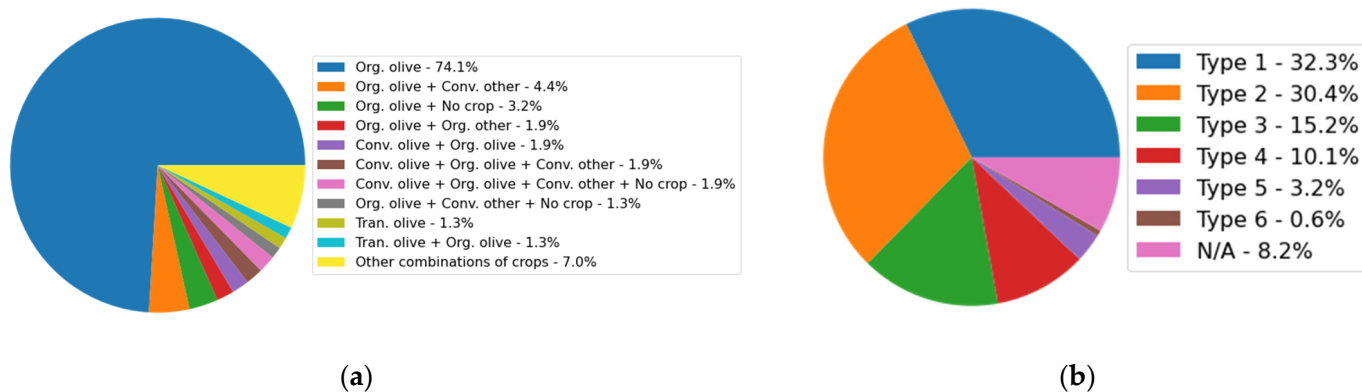(**a**)   (**b**)

Figure 7. Crop typology: (**a**) Distribution of farm type by crop; (**b**) Types of exploitation distribution.

As was just mentioned, olive grove cultivations have different characteristics, which categorise them into one typology or another. A number of associated characteristics, such as the type of irrigation, the tree age, the slope of the land and the percentage of erosion on the farm, were analysed (Figure 8). It was observed that almost 95% of the farms were without irrigation (Figure 8a), and interestingly, 50% of the farms analysed have trees that are hundreds of years old (Figure 8b). Regarding the slope of the land (Figure 8c), it was found that almost 50% of the farms have steep slopes (Type 1 and 2 farms). It was also significant that 37% of farms have medium slopes. Finally, regarding soil erosion, it was noteworthy that, despite the fact that erosion is typically more likely to occur on high

slopes that favour runoff, more than 48% of farms had a low level of erosion and 44% only a medium level (see Figure 8d).
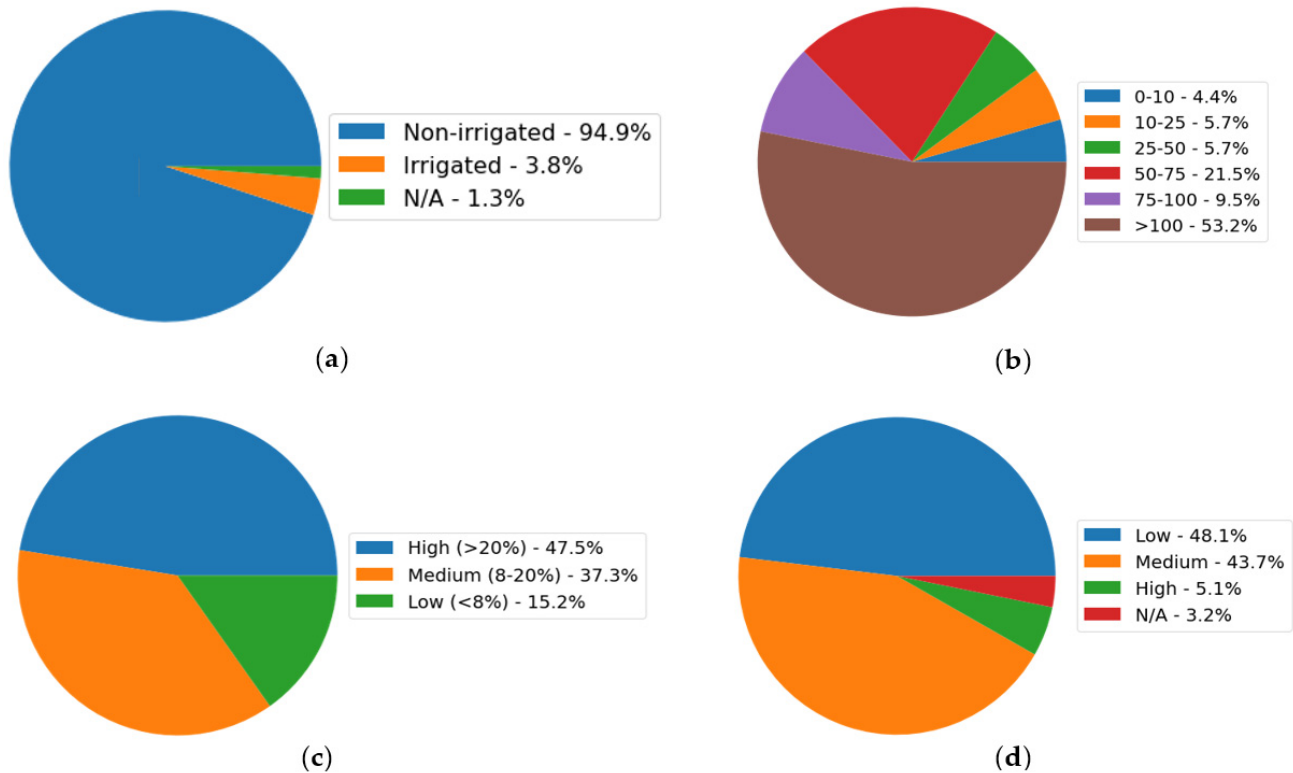

Figure 8. Characteristics of the farms analysed: (**a**) Irrigation; (**b**) Age Distribution; (**c**) Slope Distribution; (**d**) Erosion Distribution.

3.3. Production

An evaluation and quantification was made regarding whether organic olive farms are profitable through production quantity and main destination (Figure 9). It was observed that in the majority of cases, production is around 1000 kg/ha (Figure 9a), with most olives destined for mill oil production. Only 10% of the respondents use all or most of their production for table olives (Figure 9b).
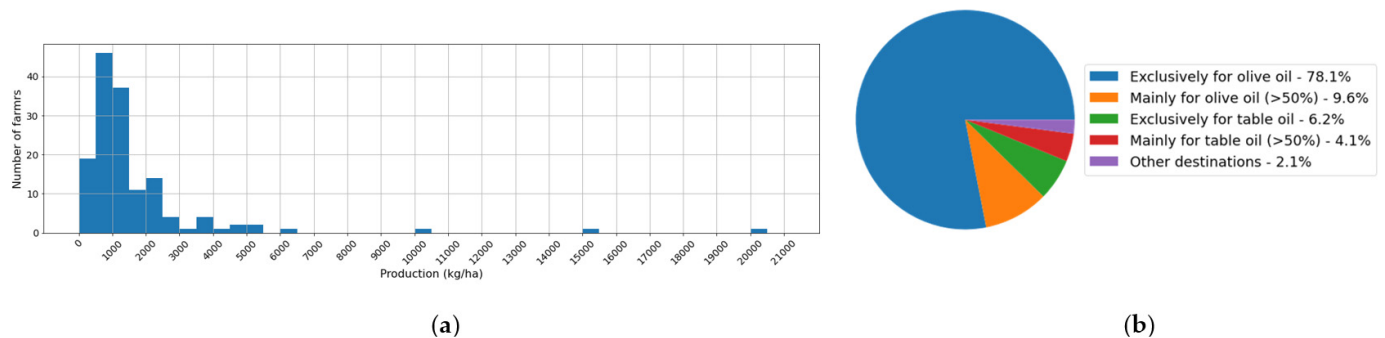

Figure 9. Farm production as analysed through the surveys: (**a**) Production distribution; (**b**) Production destination.

3.4. Acceptance of the Measure

In this section, the farmer's perception of the measures implemented for organic olive groves was analysed in terms of acceptance or non-acceptance of the measure (Figure 10). The aim was to uncover the reasons why some farmers do not accept the measures implemented for this crop.
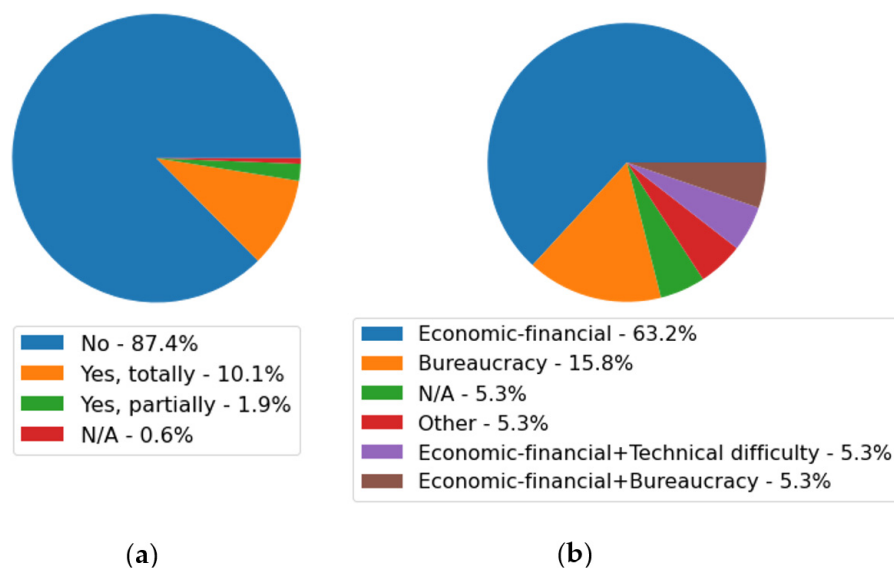
(**a**) (**b**)

Figure 10. "Acceptance of the measure": (**a**) Percentage of farms that consider abandoning organic olive grove farming in the future; (**b**) Reasons why farmers would consider abandoning organic olive growing.

It was analysed whether they might consider abandoning organic farming on their farm in the future. However, a very high number of farmers (87%) responded that they would not abandon organic farming (Figure 10a). Of the 12% who would consider leaving organic farming, it was mainly due to economic–financial reasons, with 63% believing that farmers do not perceive it as a profitable crop. Bureaucratic reasons represented almost 16% of the responses (Figure 10b).

3.5. Farmer's Knowledge

As detailed earlier, the farmers' knowledge of territory characteristics in terms of belonging to the Natura 2000 Network, Ramsar areas or nitrate-vulnerable zones was studied. These are priority areas to benefit from CAP M11, so the objective of this analysis was to determine whether the environmental vulnerability of the area was a major factor in switching to organic farming.

The results show a significant lack of knowledge regarding territory characterisations on the part of farm owners. In Figure 11, it can be observed that less than 50% of the farmers could answer these questions because they did not even know the answer when questioned on the three defined categories (Natura 2000, RAMSAR and Nitrates). In fact, in the three questions, most responses (between 33% and 44%) come from agricultural technicians in charge of conducting the surveys.
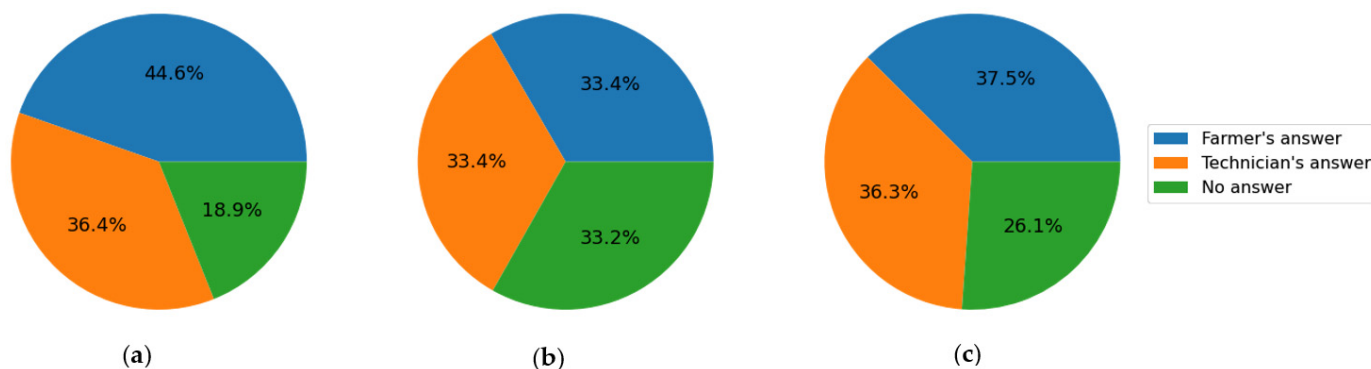

(**a**) (**b**) (**c**)

Figure 11. "Farmer's knowledge": (**a**) Farmer's knowledge of whether or not their farm belongs to the Natura 2000 Network; (**b**) Farmer's knowledge of whether or not their farm belongs to RAMSAR territories; (**c**) Farmer's knowledge on whether or not their farm belongs to High Nitrate Vulnerability zones.

3.6. Innovation and Risk Aversion

In 2019, the Regional Government of Andalusia evaluated, among other aspects of the RDP 2014–2020, the extent to which it has contributed towards promoting innovation [32]. For this reason, this aspect was included in the surveys carried out exclusively with Measure 11 beneficiaries, specifically 11.1.2 and 11.2.2.2.

Two "Multi-item" scales were used. The first one, which includes ten types of innovations (see Appendix A), asks whether the olive farmers have requested information or technical advice on that particular type of action and/or whether they have invested in each one.

The results are represented in the number of farmers who gave importance to each type of innovation by requesting technical advice and determining whether or not they have invested in that action regardless of the amount allocated. It was observed that a large number of farmers were interested in training courses (Inn10), the use of mobile applications (Inn7) and the use of integrated equipment (Inn6). They also placed considerable importance on actions to combat erosion (Inn1) and control pests or diseases (Inn4). However, only approximately 10% of farmers invested in innovations (Figure 12).
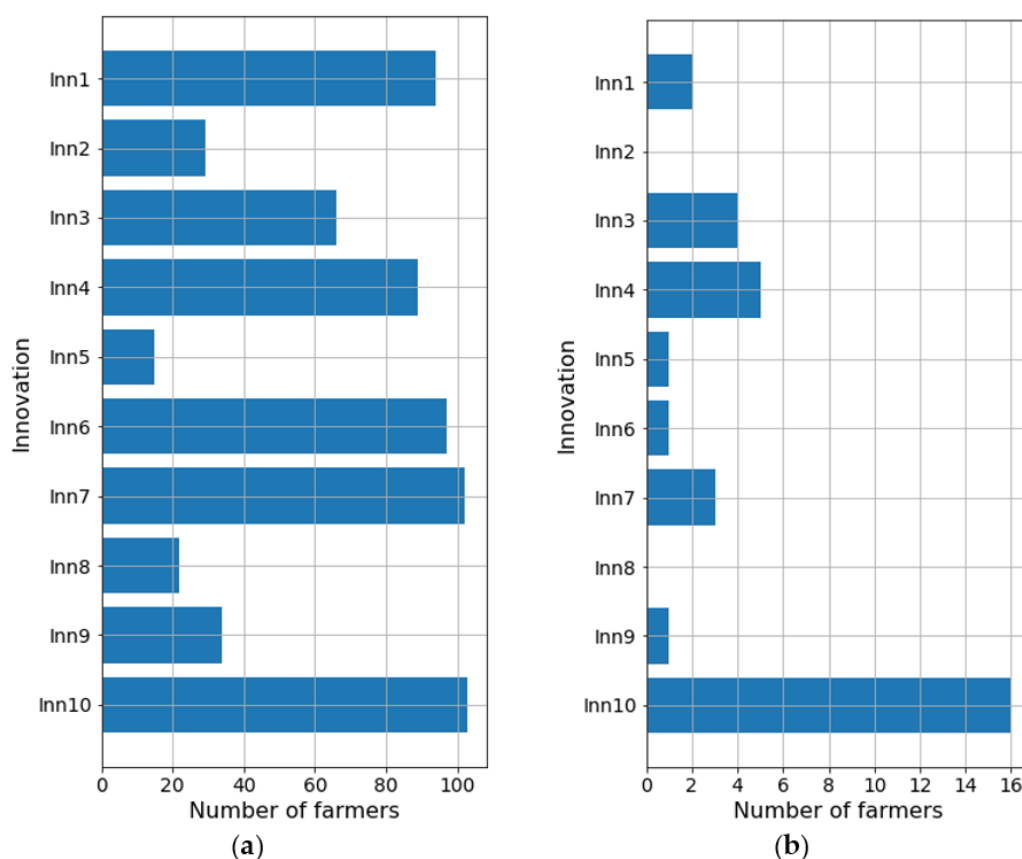

Figure 12. Farmer interest and investment in innovation: (**a**) Number of farmers who are interested in each of the innovations represented; (**b**) Number of farmers who have invested in any of the defined innovations.

On the other hand, an indirect way of assessing innovation has been analysed through farmers' risk aversion to carry out certain risk management strategies. Sixteen risk management strategies were identified in the questionnaire (Appendix A).

The results reveal that the most prominent strategies, to which they not only place importance, but also invest, are taking off-farm work (RA6), producing at the lowest possible cost (RA5) and hiring agronomical consultancies (RA9), respectively. The least valued strategies are buying farm business insurance (RA4), sharing ownership of equipment or

working jointly with other farmers (RA11) or ensuring surplus machinery capacity and/or spare parts stock (RA14) (see Figure 13).
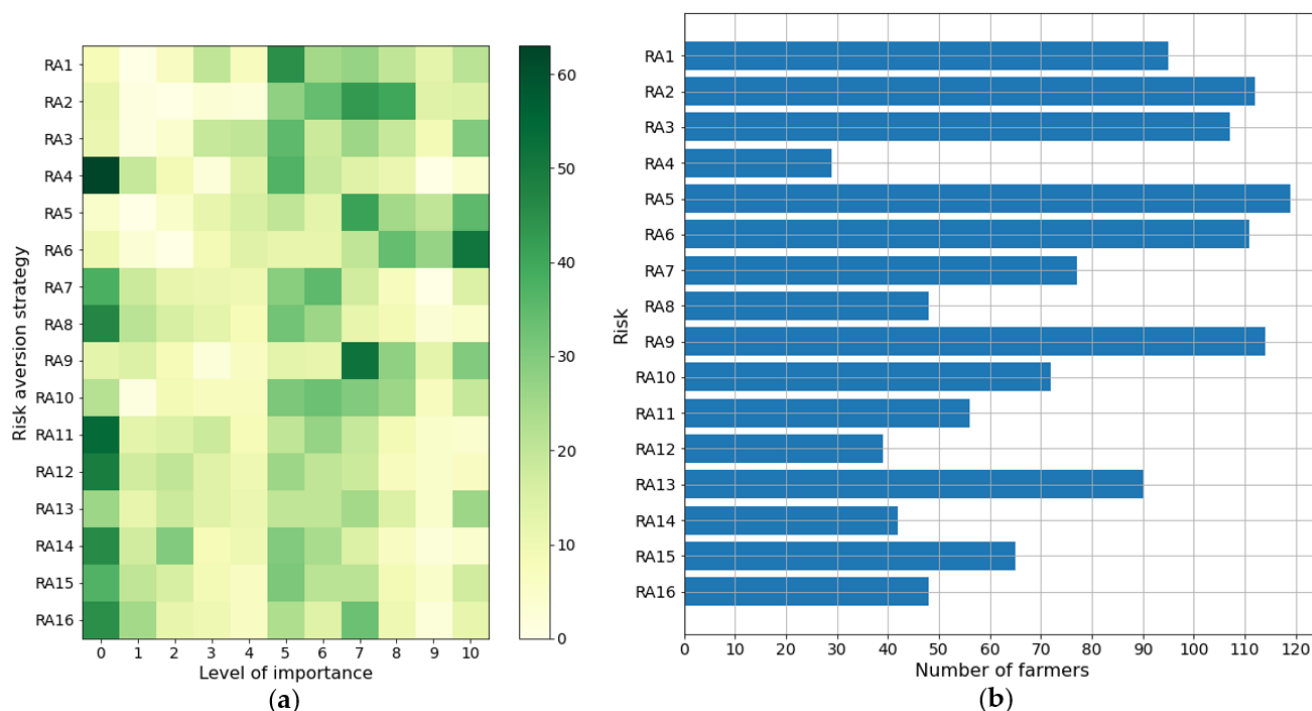

Figure 13. Importance and investment in risk management strategies: (**a**) Number of farmers who consider each of the risk aversion strategies represented as important; (**b**) Number of farmers who have invested in any of the defined strategies.

4. Discussion

Based on the starting characterisation of the organic olive farmers in Andalusia taken as a hypothesis, this article presents two important novelties. On the one hand, it provides information that is not found in public datasets and in the literature, offering a more detailed characterisation of organic olive growers in Andalusia. An example of this would be the measurement of farmers' risk aversion and tendency to innovate. On the other hand, this study contributes to research in this field with a more updated characterisation of organic olive growers. According to the knowledge of the authors, the most recent complete characterisation is from 2005 [7], although there are other partial characterisations focused on the characteristics of organic farmers and the diffusion and adoption of organic farming [6,7,23–26]. Therefore, this study updates this characterisation, presenting a current picture of the situation of organic olive growing in Andalusia.

One of the intrinsic objectives of the study was to discover the influence of European agricultural policies defined over the 2014–2018 timeframe for organic olive crops. There are two strategic lines of aid for this crop: (i) those for farmers who want to make the transition from conventional to organic farming and (ii) those for farmers who already practise this type of agriculture and plan to continue. Agricultural policies, such as Measure 11, will become increasingly important, as one of the objectives of the European Green Deal is to promote organic farming [33]. This also applies to increased social awareness, as there is a positive trend in the consumption of organic products [34]. However, in the olive sector in Andalusia, this contrasts with organic production of less than 2%. Therefore, in addition to policy measures and financial support, the support of the scientific community is required to reduce the risks and maintain correct production levels of organic crops, minimising the barriers perceived by farmers [35].

As an overall analysis of the situation, it seemed interesting to know internal comparisons for personal farmer profiles. As such, the professional level of the farmers was

compared with gender, but there was hardly any difference to be attained. The general average educational level is between primary and secondary education, and the average female representation was over 30%. However, there was no obvious or significant difference in a differentiated comparison between gender and educational level (Figure A1 Appendix B).

In a social context, the results of this study reveal that female representation has increased and that they play an important role in the sector. For example, 30% of the farmers surveyed were female compared to 20% in previous studies, as detailed in the Master Plan for Olive Growing [2]. In terms of age, there are also differences with respect to previous studies, with a considerable increase in the average age of the surveyed farmers. This highlights the problem agriculture faces due to the lack of generational replacement [7,23].

In Andalusia as a whole, other authors confirm that the geographical location of farmers and farms is, above all other factors, the key to explaining the category to which they belong in terms of their innovative character [24]. However, for our part, we have observed a considerable lack of knowledge regarding the territory characteristics in terms of Natura 2000 areas, Ramsar areas or nitrate risk areas. The lack of knowledge on the part of farmers about the economic profitability of their farms was also evident. This aspect is striking, as organic farming is considered a very profitable activity in Andalusia, but farmers do not evaluate it [25]. Indeed, only 15% of the surveyed farmers earn their entire income from agriculture. This is in line with the lack of knowledge of exploitation costs, as the technicians in charge of the surveys received few responses from farmers, and most of them were of poor quality. This meant that they were not analysed as they were not considered representative of the real population.

A striking comparison is directly related to the affinity and/or conviction of each farmer with his own type of production system (organic or conventional), which could lead to further studies. Interestingly, the same pattern of conviction was observed in both types of production, as we can see reflected in Figure A2 of Appendix B, in which both organic and conventional farmers would not change modality. For those who would abandon their cultivation method, it seems to be based on different reasons. Very decisive reasons include the economic financing conditions in the case of organic practices and a variety of reasons in conventional practices, such as financial, climatic factors or both.

Implications and Limitations of the Study

The study has several implications. First, it involves obtaining an updated and complete characterisation of organic olive farmers in Andalusia, including novel aspects, such as the risk aversion and the tendency toward innovation. Moreover, this characterisation will imply direct benefits for the CAP by providing the ability to design more specific policies aimed at achieving the set objectives. The tool developed in the AGRICORE project will also contribute to this. In addition, the study allows us to visualise the impact that the CAP M11 measure has had, both in the profile of the farmer and in the identification of possible weaknesses to take into account.

Despite the positive implications of the research, there are inherent limitations related to conducting a survey campaign, such as consistency in responses and unanswered questions. Furthermore, the methodology approach could lead to a deviation in the sample population, although it has been minimised by monitoring two main indicators: the distribution of responses from male and female farmers and the distribution of surveys by type of olive grove, which implies geographical characteristics, such as the slope. Another limitation was the lack of updated information on the types of olive groves since the most recent data in this regard are from 2009 [2]. Therefore, a more general classification had to be made by grouping the most similar typologies.

5. Conclusions

This study aims to characterise organic farmers and farms in Andalusia, covering some information gaps detected in the execution of the AGRICORE project. The M11 framework has been followed in order to fill the information gaps detected in the available public data sources that feed the AGRICORE tool. Until 2013, farms with greater production were rewarded with more economic retribution. However, there has been a change of focus, prioritising sustainability and quality over production. M11 is key to this.

In order to study the impact of M11 in the Andalusian olive sector, a survey campaign was carried out to collect data from organic olive farmers and their agricultural holdings. The survey was conducted with 189 organic olive farmers, which corresponds to 10% of the farmers who transitioned to organic olive farming in the timeframe of interest (2014–2017). From the analysed collected data, it is noteworthy that the majority of olive farmers are unaware of two aspects: (i) exploitation costs, which are crucial for company accounts, and (ii) the fact that they belong to environmentally protected areas, which has a positive impact on receiving aid associated with M11.

Furthermore, the results show that the average age of organic farmers is around 60–65 years old, more than 35% are women, they possess primary or secondary education and most of them are farm owners. Among the most important results was the fact that 74% of the farms were exclusively dedicated to the production of organic olive groves, with an average production of 1000 kg/ha. Most of this production is destined exclusively for olive oil production. In addition, it was found that more than 87% are not considering abandoning organic farming. These results are in contrast with the high reluctance of conventional farmers (more than 80%) to transition to organic production, as can be deduced from the first survey observations conducted among this type of olive farmers.

In conclusion, this study might be of considerable interest to many stakeholders, and it can have a significant impact on the Andalusian olive farming sector. On the one hand, the gathered data and their analysis provide policymakers with an up-to-date snapshot of the olive farming situation in Andalusia, in particular, the organic olive farming sector. Additionally, policymakers could benefit from the AGRICORE tool in order to design improved policies that entail an increase in organic olive production. On the other hand, olive farmers can benefit from these new policies because they will have the opportunity to voice their requirements, which will then be considered in developing new agricultural policies. Furthermore, this study increases the possibility for future work, including additional data analyses, such as comparing organic and conventional farming. To finish, it could also allow for the exploration of new lines of research, such as an exclusive study into olive farming exploitation costs.

Data Availability Statement: The collected data from the survey campaign are not available due to confidentiality issues.

Conflicts of Interest: The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

Appendix A

Table A1. Types of innovations.

Innovation	Description
Inn1	Erosion control actions
Inn2	Use of deficit irrigation practices on water-scarce farms
Inn3	Olive orchard waste composting practices
Inn4	Disease and/or pest control by plant cover and/or antagonistic fungi
Inn5	Innovation in automatic and/or Smart irrigation systems
Inn6	Use of integrated equipment for bunching, chopping and management of pruning residues
Inn7	Use a mobile app, including weather forecasting or machinery monitoring, as an aid to agronomic practices.
Inn8	Use of drones and other equipment for precision farming
Inn9	Implementation of business lines that represent alternative sources of income (Ecotourism, Cosmetics, etc.)
Inn10	Conducting training courses for all types of personnel.

Table A2. Risk management strategies.

| Innovation	Description
RA1	Liquidity–keep cash on hand
RA2	Prevent/reduce crop diseases and pets
RA3	Manage debt to ensure solvency
RA4	Buying farm business insurance
RA5	Producing at lowest possible cost
RA6	Take off-farm work
RA7	Buying personal insurance
RA8	Renting machinery and/or land is safer than buying them
RA9	Hiring agronomical consultancies
RA10	Diversifying agricultural holding activities so as not to depend only on agricultural yield (rural tourism eco-cosmetic, etc.)
RA11	Sharing ownership of equipment or operating jointly with other farmers
RA12	Buying productive factor (e.g., fertilizers) when they are cheap and storing them for future use.
RA13	Hiring economic and or accounting consultancies
RA14	Ensuring surplus of machinery capacity and/or stock of spare parts
RA15	Investing part of the benefits off-farm (stock market, real state, etc.)
RA16	Organizing the farm as a corporation to reduce exposure of personal equity.

Appendix B
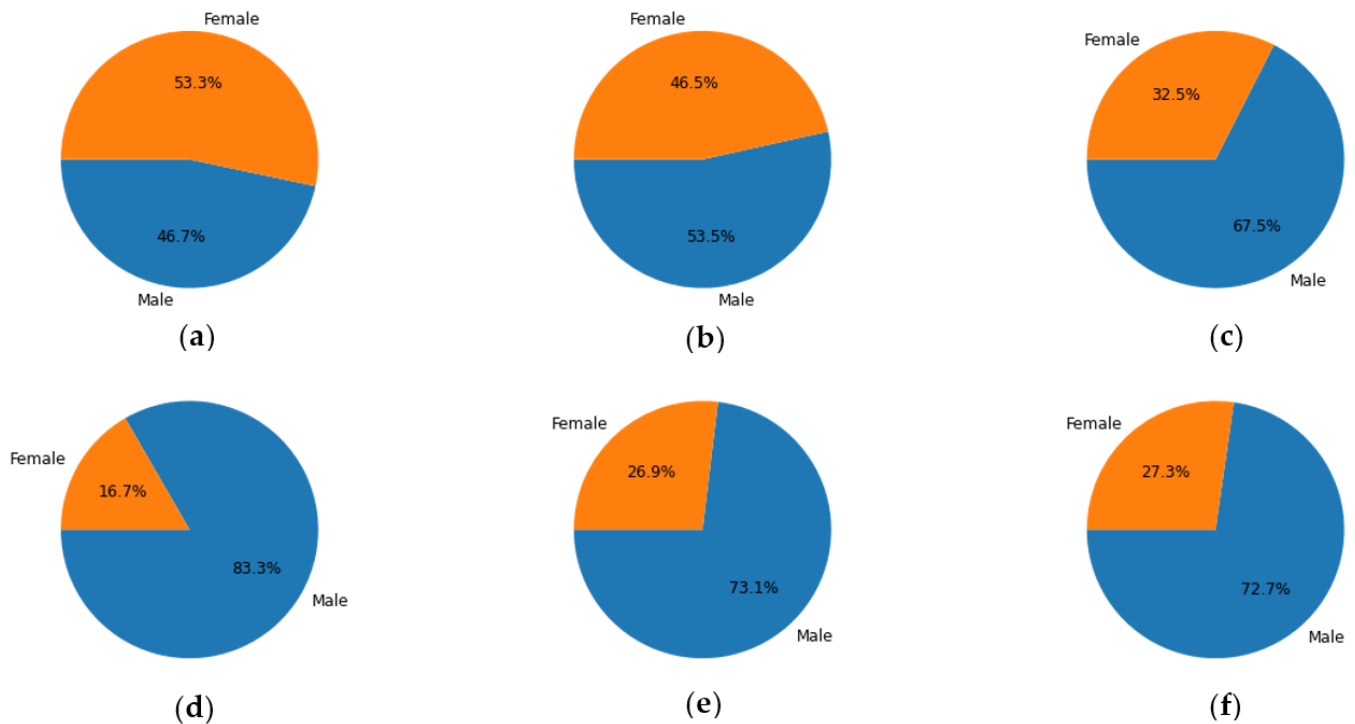
Figure A1. Comparison of the age and educational profile of farmers according to their gender: (**a**) No formal studies; (**b**) Primary education; (**c**) High School Diploma; (**d**) Professional training; (**e**) University degree; (**f**) Postgraduate studies.
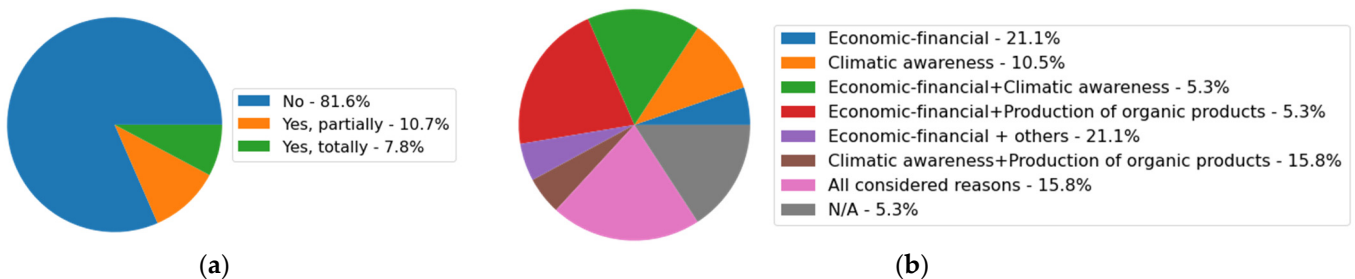

Figure A2. (**a**) Consideration of converting to organic olive farming; (**b**) Reasons for converting to organic olive farming.

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