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Two-Way Perspectives and Attitudes about Environmentally Friendly Agro-Food Production and Consumption: An Empirical Survey for Greece

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Abstract: Relying on pesticides to safeguard crops has led to pest resistance and detrimental environmental and health consequences. Many integrated pest management programs focus on producers' decision-making processes when selecting and implementing pest management interventions. Alternative approaches such as integrated pest management and biological control have been implemented to address these challenges, with Greece as the research area. A quantitative study was oriented to consumers and producers to investigate their views on the effectiveness of pesticides, aiming to assess whether these perspectives influence their attitudes toward adopting pest management practices. Primary data were gathered through structured questionnaires to consumers and producer associations (focusing on tomatoes, olives, and citrus fruits) and analyzed through multivariate methods. The findings unveiled varying preferences and concerns regarding plant protection tools, with considerations such as product effectiveness, method awareness, and sustainability. Specifically, the study revealed aspects like the popularity and demand for specific plant protection tools, the knowledge of these experts about products and pest control methods, and their stance on sustainable agriculture and environmental aspects of pest control.

Keywords: consumer attitudes; producer perceptions; environmentally friendly pesticides; innovative tools; factor analysis; logistic regression

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Citation: Ketelni, A.; Karelakis, C.; Zafeiriou, E.; Pappas, M.; Papadopoulou, K. Two-Way Perspectives and Attitudes about Environmentally Friendly Agro-Food Production and Consumption: An Empirical Survey for Greece. *Sustainability* **2024**, *16*, 6706. https://doi.org/10.3390/su16156706

Academic Editor: Ilija Djekic

Received: 17 June 2024
Revised: 30 July 2024
Accepted: 2 August 2024
Published: 5 August 2024

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1. Introduction

Pesticides have been relied upon by farmers since the beginning of time to protect their crops from a wide range of dangers, such as diseases, insects, weeds, and nematodes [1]. The primary purpose of these products was to enhance the quality of the food that was produced and to secure yield consistency. Although pesticides may be used in various practical ways, the overuse of the drastic substances and careless application have led to severe problems for humans and the environment [2]. Pesticide resistance, pollution, and health hazards for both farmers and consumers are expected results [3]. Table 1 illustrates the most important chemical pesticides and their human health impacts.

To successfully overcome the issues encountered in the agricultural sector, it is essential to discover novel solutions considering the most significant socioeconomic repercussions. Significant health concerns have been raised because of the extensive and continued use of chemical crop protection agents, which adds to the environmental duties that are already present. This is especially true in circumstances when production could be more efficiently managed. The harsh weather conditions in several countries have significantly increased

the pesticides farmers use in their agricultural operations. Agricultural goods become more dangerous due to this, highlighting the need to teach farmers the appropriate use of pesticides [4].

Table 1. Chemical pesticides and impact on human health.

Organophosphorus Pesticides: Glyphosate, malathion, parathion, and dimethoate	Cardiovascular diseases Negative effects on the male reproductive system and the nervous system Dementia Increased risk for non-Hodgkin's lymphoma neurological problems occur in children in case of prenatal exposure to organophosphates
Carbamate Pesticides: aldicarb, carbofuran, and ziram	Neurobehavioral effects, increased risk for dementia, non-Hodgkin's lymphoma
Triazines: Atrazine, simazine, and ametryn	Breast cancer incidence Oxidative stress, cytotoxicity, and dopaminergic effects

Source: https://www.eea.europa.eu/publications/how-pesticides-impact-human-health; accessed on 27 June 2024.

Within the regime structured by Agenda 2030 and specialized for the EU region, a set of good practices was introduced to reduce the use of fertilizers and pesticides in agricultural systems based on the documentation of the impact of these substances on human health and the environment [5]. The existing solutions available are not only in line with the objectives of the Green Deal and the Common Agricultural Policy, but also effective. Thus, the main issue currently involves enhancing the adoption rate of environmentally friendly low-risk pesticides as defined by the current European Union (EU) Plant Protection Commission Regulation EC No 1107/2009 (PPP reg). These involve pesticides from a biological origin, but this does not mean that all biological pesticides have a low-risk profile [6]. Those are suggested within the broader effort realized via integrated pest management (IPM), biological control, and crops resistant to pests. However, obstacles still limit the extended use of these technologies, though they have the potential to bring benefits. When it comes to cost and producer acceptability, these obstacles are most readily apparent in the market landscape, as areas that have traditional agricultural systems may have a tough time adopting this system due to the significant financial investment and the training of farmers necessary for effective implementation [7].

The degree to which IPM strategies are seen and accepted by producers is affected by various factors including the temperature, the topography, and crop species. Compared to larger-scale producers, small-scale producers often experience a greater degree of resistance to change due to their lack of the resources and technical expertise necessary to create their goods [8,9]. The increasing awareness of customers and their preference for organic food, which in turn have affected agricultural practices, have led to an increase in the need for crop protection systems that are environmentally friendly. This is a fact documented especially in the EU by the economic growth of the organic market within the time period 2000–2018, as illustrated in Figure 1.

Evidently, the expansion of retail sales in the organic market unveils the positive consumer attitude towards organic products, oriented by the perception of the environmental benefits of organic production, the consumers' demand for healthier food, as well as by the growing concern that excessive exposure to pesticides and the overuse of antibiotics have negative effects on health conditions.

The change in consumer demand encourages farmers to adopt a comprehensive strategy that considers consumer behavior, technical improvements, and socioeconomic issues to solve the difficulties brought about by pesticide use [7]. There is a pressing need for further efforts to raise awareness about the health and environmental risks of pesticide usage.

Based on the factors mentioned above, this research seeks to raise public awareness and evaluate the socioeconomic impacts of environmentally friendly production and consumption. The aim was to shed light on the market, individual, and demographic factors as

determinants for the production and consumption of environmentally friendly agricultural products. The research involves consumers and producers in Greece (focusing on tomatoes, olives, and citrus fruits) with a central objective to explore the factors determining consumers' perceptions about environmentally friendly food and producers' decisions to adopt environmentally friendly production methods. The novelty of the present study lies in its comprehensive exploration of the attitudes and perspectives of both producers and consumers towards the adoption of novel pesticide products, particularly in the context of tomatoes, olives, and citrus fruits. While the detrimental effects of pesticide reliance are well documented, this study focuses on low-risk pesticides of biological origin as an alternative to chemical pesticides in agriculture, and more specifically on the decision-making processes of producers and the factors affecting their choices in adopting innovative pest management interventions.

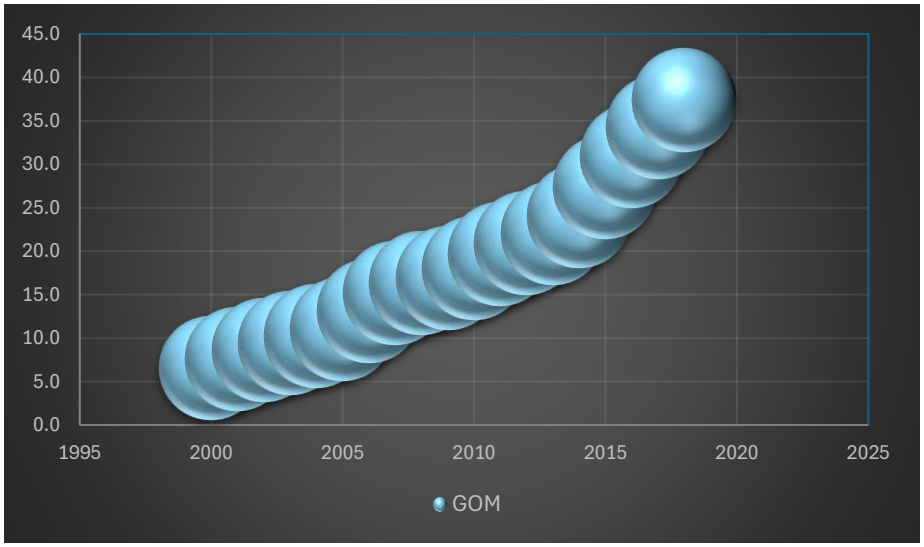

Figure 1. Growth of organic retail sales in the European Union, 2000–2018. Source: FiBL-AMI surveys 2004–2020 and Organic Data Network Surveys 2013–2015.

Accordingly, the remainder of the paper includes the theoretical background of consumers' and producers' perceptions in the second section and the materials and methods employed in the third. The presentation of the results follows in the fourth section, the fifth section discusses the study's results, and the sixth concludes.

2. Theoretical Background

2.1. Consumer Perceptions

The extensive and irresponsible use of pesticides has caused significant worry among farmers and the public over the effects of these chemicals on human health [10]. Consumers' expenses on plant protection tools are subsequently affected. The use of pesticides, the impact on the environment, the safety of products, the safety of food, and the general socioeconomic ramifications of agricultural production are issues on which consumers' views have become increasingly sensitive over the last several decades [11,12].

As a direct consequence of this enhanced knowledge, a shift in consumers' preferences for items that adhere to specific criteria has been detected, most notably those related to standards that pertain to the use of pesticides. In modern societies, a rise in the demand for organic foods has been recorded, produced with reduced or no pesticide use. Grunert [13] identifies various factors influencing consumers' choice of environmentally friendly foods and preferences. The relationship between food safety, quality, and consumer perception is a crucial indicator of how much consumers value products that fulfill these criteria. Ref. [14] argued that when making decisions about their purchases, consumers in developing nations place a high value on aesthetics, health, and environmental

awareness. Ref. [15] revealed an emotional connection to nutrition and nature. In contrast, Refs. [16,17] argued that consumers' decisions are affected by labeling that notifies the health impact of food products on consumers since today's food trends mainly stem from consumers' fears arising from a series of health concerns, as well as the ecological footprint that describes the environmental impact of the food supply function, while organic products are alluring for certain types of consumers. Moreover, the purchasing decision process in Northern European countries is gradually affected more and more by quality indices, including Protected Designation of Origin (PDO), Protected Geographical Indication (PGI), and Traditional Specialty Guaranteed (TSG) [18].

In a nutshell, the contemporary agriculture sector is beset by many problems that need novel approaches. It is important to note that many concerns relate to one another, in addition to those that pertain to health and the environment. The lack of access to food, the preservation of water resources, and the preservation of the environment are all challenges that have to be tackled [19]. The widespread and, in some cases, poorly controlled use of chemical pesticides is a significant cause for worry since it poses considerable risks to the health of consumers as well as to the environment [20,21].

Consumers have diverse perceptions of food-related sustainability, with the mainly mentioned categories referring to environmental impact, locally and organically sourced food, and ethical production. However, modern literature reveals that consumers still lack crucial knowledge on certain specific topics related to food sustainability. Notably, they struggle to define "sustainability" and to assess the environmental impact of their food choices. Overall, consumers believe that sustainability is not the main criterion for their food purchasing decisions. Presently, factors such as price, taste, and individual health are considered more influential than sustainability [22,23].

Consumers' opinions on plant protection products reflect their growing understanding of the environmental and health risks of agricultural operations. Their behavior has been altered due to the abundance of information and purchase of food that satisfies demanding standards, especially concerning the use of environmentally friendly pesticides. As we navigate the difficulties that contemporary agriculture must confront, we must make progress in developing creative solutions that promote environmental sustainability, public health, and socioeconomic well-being. We must reduce our dependency on chemical pesticides and increase the utilization of alternatives to secure the health of the agricultural environment and thus allow sustainable agriculture to be an achievable objective [24,25].

2.2. Producer Perceptions

Producers have depended on pesticides for a long time to protect their crops against many threats, including diseases, arthropod pests, weeds, and nematodes. Their objectives involved enhancing food production quality and guaranteeing that yields could be sustained over an extended period [26]. Unfortunately, the improper use of pesticides has resulted in a rise in the development of pesticide resistance, which has, in turn, severely influenced ecosystems and people's health [27].

The social side of the problem is closely related to the demographic makeup of the agricultural industry and the farmers employed within it. Compared to developing countries, industrialized nations have a far higher success rate in adopting new technology to carry out ordinary duties. It is of the utmost importance to have a fundamental comprehension of the process by which technology functions and the capabilities it has [28–32]. As producers tend to be older on average, they have much higher levels of education and living conditions. Consequently, this leads to a complete grasp of technical ideas and functions, including protecting health, preserving the environment, and maintaining economic efficiency.

Regarding farming, offering a standard framework for using joint integrative pest management (IPM) techniques is challenging because each crop has its unique set of criteria that must be met. Precision spraying and other precision agricultural approaches are advocated to reduce harmful effects [33,34]. Refs. [35,36] revealed that producers are

interested in using novel technologies, concluding that the demographics were not the key drivers of IPM adoption. The socioeconomic environment of the nation, the kind of agriculture and agricultural production, and the country's geographical location and climate may be possible drivers of IPM [33,37].

Furthermore, small-scale producers with few resources are less likely to accept these practices due to their lack of knowledge, awareness, and financial assistance [8,9]. On the contrary, those who operate on a larger scale often need more resources to accomplish the move. The frequency and kind of weeds and insects that farmers must deal with, as well as the efficacy of the treatments used, are all influenced by various geographical factors [38,39].

3. Materials and Methods

3.1. Survey Instrument

The structured questionnaires addressed to producers and consumers were designed to identify the main determinants of production and consumption for new innovative plant protection products that could be developed and made available as low-risk agrochemicals. The objective was to collect primary data and construct a composite index reflecting how climate change and environmental constraints influence the attitudes of consumers and producers towards methods combating harmful organisms used in crop production. Additionally, this research investigates how these factors, along with capital, land, and human resources constraints, impact producers' decisions to adopt these tools, including economic dimensions such as net added value and employment.

The drafting of the questionnaire began in July 2020 and was completed in August 2020. The questions in each questionnaire were derived from an extensive review of relevant international literature, with necessary modifications to align with the research focus and the crops under examination [29,30,39–47]. Apart from questions already validated and reliable from the literature review, the questionnaire also included questions that were developed in the pilot study. The five sections of the questionnaire for olive, tomato, and citrus crop producers included, first, questions related to the personal information of producers to create their demographic profiles. The second section had eleven questions regarding farming practices and various economic aspects. The third section contained seven questions about producers' attitudes towards environmentally friendly pest control methods/tools and their sources of information on these tools. The fourth section consisted of ten questions about producers' attitudes toward pesticide application, including the type and origin of pesticides used. The fifth section of the questionnaire included five questions about producers' attitudes towards the environment and climate change.

Following a similar process, the consumer questionnaire was developed in July–August 2020. Questions were based on a comprehensive review of relevant international literature, with necessary adaptations to match the research objectives and the examined crops [47–52]. Accordingly, most of the questions included in the survey instrument for consumers were validated and reliable stemming from the literature review. This questionnaire comprised two main sections. The first section included 28 closed-ended questions concerning consumers' attitudes and perceptions towards innovative environmentally friendly pest control tools (EFCTs). Specifically, questions were formulated regarding consumers' purchasing behavior towards products produced using such tools, their attitudes towards food, and questions related to the environment and climate change control. The second section of the questionnaire contained questions about consumers' demographic information and education level.

Sampling was conducted in two stages. In October 2020, the first stage involved conducting a pilot study with a sample of 20 producers to collect data for the preliminary questionnaire validation. Initially, the questionnaire was examined for its syntactic, semantic, and objective adequacy. Although there were no substantial problems with the questionnaire's structure, a second check during the pilot study was conducted to estimate the average time required to complete it, along with some observations and suggestions for

conceptual adequacy and structural improvement. The validation was performed through personal interviews with olive, tomato, and citrus crop producers. The questionnaires for producers and consumers took their final form (some questions were reformulated, and others were removed due to their non-significant contribution to the research). The next stage involved the actual collection of questionnaires.

The sample for this research consists of 583 questionnaires, specifically comprising 477 consumer responses and 74 producer responses. As for the consumer sampling procedure, we implemented random sampling to develop the final sample for consumers. The population size was the total Greek population (10,782.487 citizens), and with a confidence error of 98% and margin error of 5%, the minimum number of necessary samples to meet the desired statistical constraints was 543 respondents. Hence, after validating the sample, the questionnaire was uploaded to social media through Google Forms to obtain the responses.

As for the producer sampling procedure, we aimed mainly at producer associations who cultivate olives, citrus, and tomatoes. Since sending the questionnaire electronically entailed certain risks, the decision was to personally interview the specific producers. Accordingly, producers who were based in Northern Greece (Central Macedonia and Anatoliki Makedonia and Thraki) were chosen to synthesize the final sample, mainly to minimize the cost of the survey. Each producer was initially contacted via telephone to confirm his/her participation in the study, and a meeting was scheduled to answer the questionnaire. Given the specific constraints that exist when surveying producers (i.e., unavailability, reluctance to expose economic data, cultivation period, etc.), 74 producers from the three cultivation types finally answered the questionnaire.

3.2. Methods

The collection of questionnaires was followed by a statistical analysis aiming initially at analyzing the demographic profile of the three respondent categories. Subsequently, the goal was to identify the factors that explain their attitude toward using environmentally friendly pesticides and, more generally, actions related to environmental protection. One additional statistical analysis was performed before estimating logit models and categorical regressions, namely factor analysis. Factor analysis aimed to identify factors in the case of multi-thematic questions, a process followed in both respondent categories. The data reduction technique used was Principal Component Analysis (PCA) with a Varimax rotation and an eigenvalue greater than one as the extraction criterion. Subsequently, a regression model used the factors extracted as variables (Figure 2).

Logistic Regression Model

A multivariate statistical analysis approach known as logistic regression is used to study the behavior of a categorical dependent variable that is dichotomous and categorical [53,54]. This method uses a collection of independent factors to interpret the behavior of the dependent variable. Using this strategy, we can predict the existence or absence of a particular element or event. Because the objective is to evaluate the likelihood of a specific event's occurrence, the values derived from the linear model lie within the interval [0, 1]. For this reason, we assume that the variable follows a binomial distribution and the connection of the probability of the event occurrence p_i is linked to the linear model through the logit function:

$$logit(p) = \ln(odds) = \ln(p/(1-p)) = b_0 + b_1X_1 + b_2X_2 + \ldots + b_kX_k \quad (1)$$

where

- p is the probability of the dependent variable;
  $odds = \frac{p}{1-p}$ are the odds of the dependent variables;
- $X_1, X_2, \ldots, X_k$ are the independent variable or maximum likelihood estimators;

- $b_0, b_1, b_2, \ldots, b_k$ are the model's coefficients that must be determined to maximize the likelihood of the observed sample values.

Equation (1) can be written as follows:

$$odds = \frac{p}{1-p} = e^{b_0} * e^{b_1 X_1} * e^{b_2 X_2} * \cdots * e^{b_k X_k} \quad (2)$$

Therefore, the interpretation of each coefficient in the above equation is that when the variable X_k changes by one unit, with all other factors remaining constant, the odds will change by a factor of e^{b_k} . A coefficient with a positive (negative) sign indicates that an increase in the corresponding independent variable will increase (decrease) the relative probability of the dependent variable.

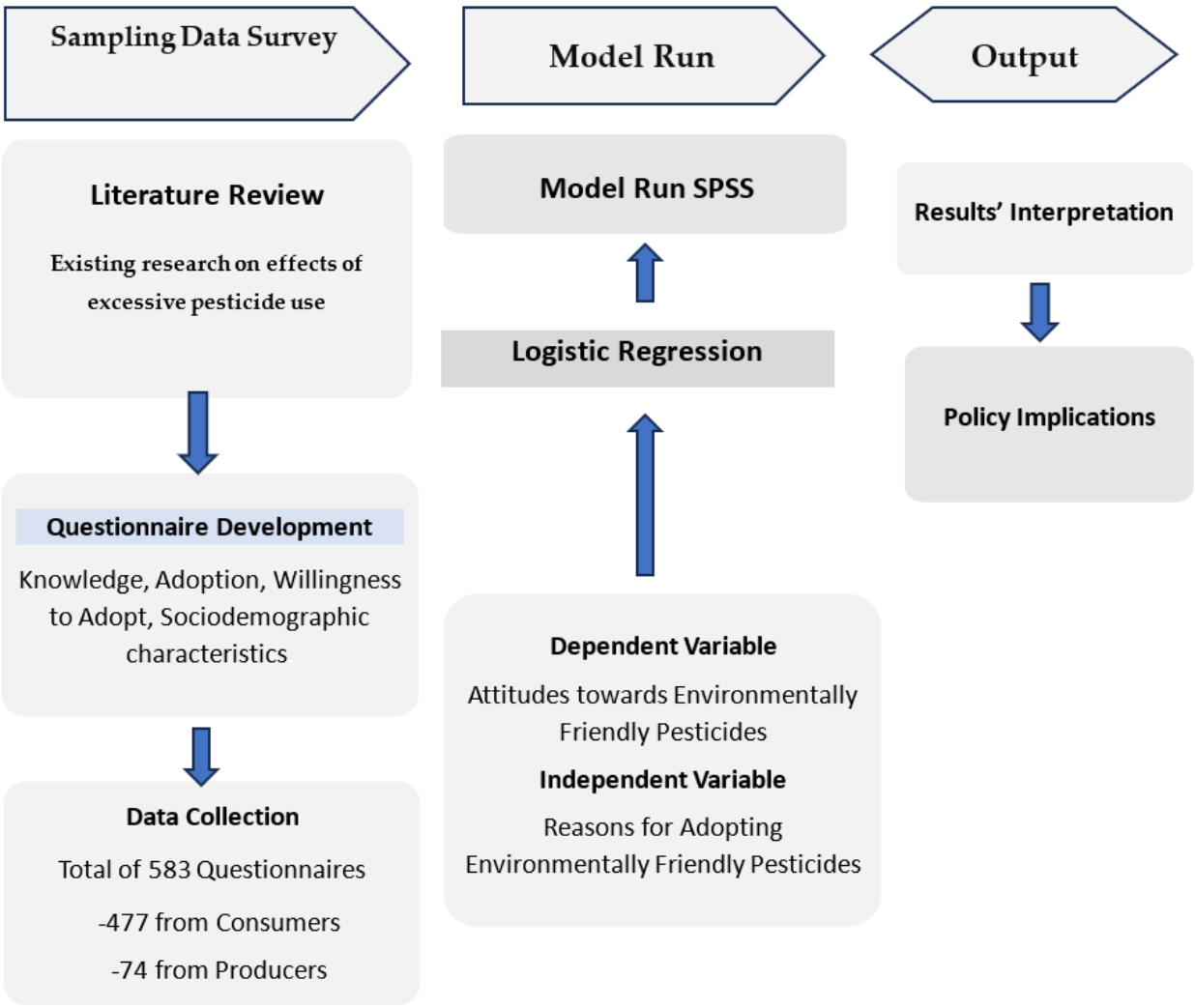

Figure 2. Flow chart of the methodology.

Finally, the probability of the event is calculated using the inverse logit function in the following Equation (3):

$$p = \frac{1}{1 + e^{-logit(p)}} \quad (3)$$

In logistic regression models, the coefficients are estimated via the maximum likelihood method instead of the least squares method. The coefficients of the model undergo significance testing. The hypothesis under consideration is

$$H_o : \hat{\beta}_i = 0$$

$$H_1 : \hat{\beta}_i \neq 0$$

The test is conducted at a significance level of α %, and the statistical function under H_0 is the Wald function, which asymptotically follows the normal distribution. The square of this function follows the X^2 distribution with 1 degree of freedom. The hypothesis is rejected if the test value exceeds $X^2_{1;\alpha/2}$ [54].

Model comparison for selecting the optimal model is carried out using the Deviance statistic, essentially a likelihood ratio test, defined as $D = -2\left\{\hat{l}_2 - \hat{l}_1\right\}$.

Where

- $\hat{l}_2$ is the deviance of model 2;
- $\hat{l}_1$ is the deviance of model 1. Additionally, model 2 is a subset of model 1 and follows the X^2 distribution with k-p-1 degrees of freedom [54].

4. Results

This section, firstly, presents the results of a statistical analysis focusing on the demographic characteristics of 474 consumers surveyed. Regarding their gender, the majority were females (50.7%), and a significant portion of the sample was aged within the interval 18–25. Regarding marital status, a high percentage were married (41%), with most having four children. A small percentage of households involved individuals over the age of 65. Concerning the income class, most respondents fell into the second, third, and fourth classes, with incomes ranging from 500 to 2000 euros per month. Approximately 50% of respondents had full-time employment, while 22% of the respondents' spouses were unemployed. It is worth noting that most respondents were public employees, and their level of education was significantly high.

As for the surveyed producers, based on the demographic analysis, we observed that most respondents were men aged 21 to 39 years old, married, and highly educated. Their income ranged from 10,000 to 20,000 euros per month, with the production cost being less than 50% of their income. In contrast, most do not belong to a cooperative (61.8%) or other producer association (78.9%). In contrast, the percentages of respondents belonging to a cooperative (38.2%) or a union (21.1%) were very low. The demographic profiles of consumers and producers are provided in Appendix A in Tables A1 and A2, respectively.

4.1. Results of Factor Analysis

Consumers

Multifaceted questions from the consumer questionnaire were selected to contribute to constructing indicators. Before conducting these procedures, the reliability was checked using the Kaiser–Meyer–Olkin Measure of Sampling Adequacy criterion, with estimated values ranging from 0.69 to 0.8 in all cases, i.e., close to 0.7, indicating the sampling adequacy. Based on the analysis findings, the question addressing food consumption criteria includes three factors: criteria related to their contribution to health, their contribution to weight control, and the taste and aroma of the food (Table 1). The factors that were extracted representing the mentioned criteria were FC1 (Purchase of products based on health), FC2 (Taste and aroma criteria), FC3 (Purchase based on weight control), FC4 (Label and product promotion criteria), FC5 (Price and taste criteria), FS1 (Consumer perceptions of adopting practices by producers regarding food safety), EP1 (Environmentally friendly actions), EP2 (Modes of transportation) and EP3 (Indifference/ignorance about environmentally friendly actions). Consumers' perceptions of adopting practices from producers regarding food safety were also investigated. Only one factor (FS1) was extracted, which explains 82.4% of the variance explained by this multifaceted question. Finally, the pro-environmental policies adopted by consumers in their daily lives were also explored, and three factors were confirmed: EP1 (Environmentally friendly actions), EP2 (Modes of transportation), and EP3 (Indifference/ignorance about environmental practices).

4.2. Producers

Specific questions with a wide range of features were selected from the questionnaire sent to the producers to facilitate the development of appropriate indicators. We used the Kaiser–Meyer–Olkin Measure of Sampling Adequacy to determine whether the samples were reliable. In every case, the estimated value was between 0.698 and 0.8, which is close to 0.7, suggesting that the sampling was sufficient. After careful consideration, the criteria were divided into economic, environmental, and customer-centric. This was carried out via factor analysis to ascertain the reasons for implementing activities that benefit the environment. According to Table 2, the factors that were extracted were B1 (Economic criteria), B2 (Environmental criteria), B3 (Customer-centric criteria), B4 (Effectiveness of environmentally friendly products), B5 (Perceptions of pesticide impacts), and B6 (Necessity and favorable effects on performance and production). Producers' reasons for adopting environmentally friendly practices were also investigated. Only one factor (B4) explains 77% of the variance extracted. Finally, the barriers to implementing environmentally friendly plant protection methods/tools were also explored, and several factors were confirmed, highlighting the complexity of these decisions.

Table 2. Factor analysis of the consumers' food consumption criteria.

Code	Criteria	Loadings	Variance Explained
FC1	Purchase of Products Based on Health		80%
	Contains many vitamins	0.845	
	Helps me stay healthy	0.823	
	Is nutritious	0.825	
	Does not contain additives or preservatives	0.668	
	Contains natural ingredients	0.746	
	Does not contain artificial ingredients	0.772	
FC2	Taste and Aroma Criteria		80%
	Smells nice	0.855	
	Looks nice	0.874	
	Has a nice taste	0.732	
FC3	Purchase Based on Weight Control		80%
	Has low calories	0.891	
	Helps me control my weight	0.819	
	Has low fat	0.801	
FC4	Label and Product Promotion Criteria		80%
	Producer/label	0.824	
	Recommendation from known/friend	0.812	
	Adoption of environmentally friendly practices indication	0.590	
	Producer/label	0.824	
FC5	Price and Taste Criteria		80%
	Price	0.693	
	Taste		
FS1	Consumer Perceptions of Adopting Practices by Producers Regarding Food Safety		82,4%
	Sufficient ability to control food safety	0.856	
	Necessary knowledge to ensure food safety	0.870	
	Honest about food safety	0.942	
	Inform about food safety	0.906	

Table 2. *Cont.*

Code	Criteria	Loadings	Variance Explained
FS1	Pay attention to food safety	0.944	
	Particularly interested in food safety	0.925	
	Sufficient ability to control food safety	0.856	
	Necessary knowledge to ensure food safety	0.870	
EP1	Environmentally Friendly Actions		67%
	Separation of most waste for recycling	0.634	
	Reduction of energy consumption	0.782	
	Reduction of water consumption	0.890	
	Reduction of consumption of disposable items	0.810	
	Choosing local products or grocery items	0.742	
	Purchase of environmentally friendly products with relevant labeling	0.752	
EP2	Modes of Transportation		67%
	Choosing environmentally friendly modes of transportation (walking, cycling, public transportation)	0.668	
	Restriction on car usage	0.831	
EP3	Indifference/Ignorance About Environmentally Friendly Actions		67%
	None of these	0.837	
	Others	0.695	
	Don't know	0.669	

Own calculations.

Factor analysis was performed to explore the actions that limit climate change and potentially affect the farm's performance. Seven factors were extracted (Table 3): B1 (Criterion of health and environmental impacts), B2 (Economic and practical efficiency), B3 (Sources of influence on the pesticide market), B4 (Perception of environmental impacts of agriculture), B5 (Adoption of strategies to mitigate climate change), B6 (Impacts of climate change limitation), and B7 (Measures limiting climate change impact on business). Producers' barriers to implementing environmentally friendly production methods were also investigated, and only one factor (B6) explains 90% of the variance extracted.

Table 3. Factor analysis for the producers' reasons for adopting environmentally friendly practices.

Code	Reasons For Adopting Environmental Practices	Loadings	Variance Explained
B1	Economic Criteria		81%
	Higher profitability	0.737	
	Increased production	0.817	
	Availability of environmentally friendly tools	0.658	
	Farm size	0.829	
	Experience in pesticide use	0.666	
	Local pressures of pests or diseases for pesticide application	0.690	
	Low overall cost compared to conventional methods	0.820	
	Resistance/efficacy of pesticides	0.619	

Table 3. *Cont.*

Code	Reasons For Adopting Environmental Practices	Loadings	Variance Explained
B2	Environmental Criteria		62%
	Better agricultural product	0.592	
	Conventional pesticides are not sustainable	0.537	
	Reduction of the impact of pesticides on the broader area	0.750	
	General scientific warning of environmental risk from the use of conventional pesticides	0.658	
	Less use of fertilizers	0.900	
	Development of reduced-risk pesticide strategies	0.911	
B3	Customer-Centric Criteria		74%
	Increased product demand	0.837	
	Imposed food safety standards	0.615	
	Premium paid-for environmentally friendly products	0.761	
	The high price of the final product	0.879	
	Increased consumer awareness	0.778	
	Barriers to the implementation of environmentally friendly plant protection methods/tools		77%
	Contribution of technical knowledge		
	Lack of knowledge about innovative plant protection tools	0.800	
	Lack of training	0.837	
	Insufficiency of innovative plant protection tools	0.851	
	Availability of pesticides	0.665	
	Lack of coordination between producers and agricultural consultants	0.777	
	Fear of the effectiveness of innovative plant protection tools	0.753	
	More time is needed to achieve the expected result	0.567	
	No distinction regarding the price of environmentally and non-environmentally friendly products	0.834	
B4	Effectiveness of Environmentally Friendly Products		77%
	More time is needed to achieve the expected result	0.735	
	Requires more labor	0.823	
	Effectiveness of biological control factors	0.666	
B5	Perceptions of Pesticide Impacts		78%
	Adverse effects of pesticides on humans	0.806	
	The harmful effects of pesticides may be severe	0.885	
	Pesticides affect human health	0.895	
	Pesticides enter the body through the skin	0.824	
	Pesticides enter the body through the mouth	0.868	
	Pesticides enter the body through the nose	0.885	
	Pesticides affect animals	0.892	
	Pesticides affect the environment	0.834	

Table 3. *Cont.*

Code	Reasons For Adopting Environmental Practices	Loadings	Variance Explained
B6	Necessity and Favorable Effects on Performance and Production		74%
	There could be alternative solutions for pesticides in my production	0.854	
	Pesticides are necessary for high yield and product quality	0.815	
	Pesticides are necessary in my production	0.805	
	The body can develop immunity to pesticides	0.831	
	Higher toxicity or a mixture of pesticides can improve crop production	0.895	
	Pesticides affect soil fertility	0.613	

Own calculations.

4.3. Model Estimation Results for Consumers and Producers

Consumers

For this regression analysis, the dependent variable was the chance of selecting things certified for their protection utilizing environmentally friendly plant protection equipment instead of those subjected to a conventional manufacturing process. To provide more clarification, the fixed-term model seems to merely interpret, in a manner that is not statistically significant, the willingness of consumers to pay a higher amount than the price that is now being offered. A second categorical regression was analyzed within the scope of the data analysis to discover the factors that affect the consumers' willingness to pay a higher price than the existing price for food protected by environmentally friendly plant protection products.

According to the results of the estimated model, it was concluded that each of the determinants had statistical significance. The consumers' willingness to pay more for food is subject to eco-friendly plant protection increases with age (a higher priority is given to good nutrition), working time (also a priority for people with long working hours is good and quality nutrition), their positive attitude towards foods that have eco-friendly plant protection, the taste, and labeling of products for eco-friendly plant protection use, as well as their perception of producers' attitudes and knowledge of food safety issues (Table 4). In addition, concerning the lower probability (unwillingness) to pay more than the current price, the country of origin has a more significant impact on leisure time, education (the lower the level of education, the lower the willingness to pay more), indifference, and lack of information of consumers about food products to which eco-friendly plant protection are applied. Explicitly, all the above factors function as barriers to the consumers' willingness to pay more.

Table 4. Factor analysis for the producers' barriers to implementing environmentally friendly production methods.

Code	Factors	Loadings	Variance Explained
B1	Criterion of Health and Environmental Impacts		77%
	Ingredients—judged by their impact on health	0.933	
	Ingredients—judged by their impact on the environment	0.902	
	Package warnings regarding impacts (labeling)	0.846	
B2	Economic and Practical Efficiency		
	Ingredients—judged by their effectiveness against pests	0.885	

Table 4. *Cont.*

Code	Factors	Loadings	Variance Explained
B2	Personal experience with the product from previous use	0.745	
	Price	0.881	
B3	Sources of Influence on the Pesticide Market		
	Producer	0.658	
	Recommendations from friends	0.831	
	Recommendations from sellers	0.717	
	Other factors	0.497	
	Interpretative ability of variability		78%
B4	Perception of Environmental Impacts of Agriculture		
	Negative impacts due to fertilizers		
	Environmental burden due to excessive use of chemical fertilizers	0.743	
	Environmental burden due to excessive use of pesticides	0.836	
	Pollutes the water horizon more than other cultivations	0.728	
	Burdens the environment as well as other cultivations	0.729	
	Positive impacts		
	Burdens the environment due to increased water needs	0.463	
	Linked to positive impacts on the environment/landscape	0.921	
	Aids in the conservation of the environment and natural resources	0.894	
	Interpretative ability of variability		69%
B5	Adoption of Strategies to Mitigate Climate Change		
	Environmentally friendly cultivation practices	0.911	
	Less polluting fertilizers and pesticides	0.907	
	Use of renewable energy sources	0.831	
	Energy-efficient practices	0.851	
	Irrigation and none		
	Irrigation practices	0.760	
	None	0.804	
	Interpretative ability of variability		78%
B6	Impacts of Climate Change Limitations		
	Will worsen my and my family's health	0.959	
	Will reduce the profitability of my operation	0.995	
	Will degrade the quality of my products	0.991	
	Will worsen the living standards in society	0.948	
	Interpretative ability of variability		9%

Table 4. *Cont.*

Code	Factors	Loadings	Variance Explained
B7	Measures Limiting Climate Change Impact on Business		
	Environmentally friendly cultivation practices	0.867	
	Less polluting fertilizers and pesticides	0.862	
	Use of renewable energy sources	0.890	
	Energy-efficient practices	0.876	
	Irrigation practices	0.890	
	None	0.315	
	Interpretative ability of variability		9%

Finally, consumers' perceptions of producers' intention to certify their products and adopt such practices enhance the probability of paying more in a statistically significant way. Even though the rates were far lower, the impacts were equivalent to the increased prices of other products, which were significantly more substantial.

4.4. Producers

In dichotomous regression, we used the producer's willingness to replace conventional plant protection products with environmentally friendly products as the dependent variable. Several demographic characteristics were used as independent variables, incorporating reasons for adopting or preventing the use of ECR, climate change's economic and environmental impacts, and variables linked to obstacles or producers' attitudes and actions towards the environment. The results of the model estimation are provided in the following Tables 5 and 6.

Table 5. Estimation results of consumer willingness to pay for products with pesticide residue.

		B	SIG.	EXP(B)
	Constant Term	2798.805 ***	0.000	
	Percentage of fruits and vegetables consumes per week	−26.683 ***	0.000	2.580×10^{-12}
	Contribution of country of origin	−4014.449 ***	0.000	0.000
	Education	−387.578 ***	0.000	4.752×10^{-169}
	Free time	−252.725 ***	0.000	1.750×10^{-110}
	Age	423.010 ***	0.000	5.142×10^{183}
	Working hours	221.387 ***	0.000	1.403×10^{96}
B1	Adoption of environmental actions	280.143 ***	0.000	4.619×10^{121}
EP1	Preferences for purchasing items using environmentally friendly plant protection products	302.079 ***	0.000	1.554×10^{131}
FC4	Indifference and ignorance products with pesticide residue	−1762.301 ***	0.000	0.000
FC4	Label	−101.905 ***	0.000	5.534×10^{-45}
FC5	Taste	655.204 ***	0.000	3.559×10^{284}
FC4	Labeling for adopting environmental practices	251.268 ***	0.000	1.331×10^{109}
B6	Perception of producers' knowledge of food safety and certification	112.200	0.023	8.504×10^{139}

*** Rejection of null hypothesis at the 5% level of significance.

Table 6. Estimation results of a dichotomous regression model for producers.

	Variables	Coefficient
	Reasons for environmental protection	14.2 ** (0.03)
B2	Economic reasons	2.692 *** (0.00)
	Others	0.221
	Government policy	0.933 ** (0.03)
	Lack of education and information	4.325 *** (0.01)
	Effectiveness and adequacy of ECR	2.192 * (0.08)
	Perception of a significant impact of ECR on income	2.4 ** (0.04)
	Perception of the social impact of climate change	3.24 ** (0.04)
	Understanding the environmental impact of climate change	2.692 * (0.08)
	Understanding the economic impact of climate change	31.62 *** (0.000)
	Age	−10.8 *** (0.01)
	Education (master's)	5.833 *** (0.01)
	Education (PhD)	4.2 ** (0.04)
	Production cost	−2.11 ** (0.03)
	Perception of a significant change due to climate change in agricultural income	4.2 ** (0.04)

* Statistically significant at $p < 0.1$; ** Statistically significant at $p < 0.05$; *** Statistically significant at $p < 0.01$.

Farmers are affected by demographic characteristics such as education level or age when deciding whether to use environmentally friendly plant protection solutions. Those with master's or PhD degrees are more receptive to implementing ecologically friendly practices due to their knowledge. Furthermore, the perceptions of the income repercussions of climate change might have a statistically significant impact on this result. Environmental and economic factors have a positive and statistically significant effect on the willingness of farmers to replace conventional pesticides with environmentally friendly plant protection. Thus, environmental and economic factors are critical to the probability of adopting environmentally friendly plant protection.

On the other hand, the choice to use ecologically friendly plant protection rather than conventional protection is limited by the higher costs attached to the decision. Furthermore, the decision to prefer ecologically friendly plant protection over conventional pesticides is determined by the individual's comprehension of the social and environmental ramifications of climate change and their expectation to experience the effects of climate change. Additionally, in line with those mentioned above, adopting laws that will ensure decreased pricing and enhance the knowledge and awareness of farmers may enable the replacement of conventional pesticides with environmentally friendly plant protection. This is because the laws will guarantee that farmers understand the situation. However, we should mention that the data deficiency was a significant barrier to gathering conclusions on the degree of adoption in terms of individual crops.

5. Discussion

5.1. Consumers

In most of the consumer demographics that were questioned, the respondents were females who were employed in the public sector, between the ages of 18 and 25, and had a high education level. Notably, even when presented with a higher price point, these consumers showed a common inclination to choose environmentally friendly food (EFF) rather than conventional goods. This is an important finding highlighting the preference for EFF due to female sensitivity and environmental benefits. Surprisingly, despite the consumers' high need for EFF, they are reluctant to switch grocery stores for their pre-

ferred type of food. This underscores the importance of the sources of products and the marketplaces in the local area. There was a distinct trend of consumers who avoided synthetic and organic pesticides, and this pattern was detected by the respondents of the survey. The participants have phrased their concerns over the potential adverse effects on their health brought about by chemical pesticides, while the consumers' knowledge of the environmental impact caused by pesticides stresses the product certification significance as a criterion to be preferred.

It was revealed that the key driving factors for consumers' desire for this product were the flavor of EFF as well as the health benefits that have been associated with it. Furthermore, the role of EFF in the control of weight was taken into consideration. In contrast, the survey results revealed an extensive knowledge gap among consumers about food safety and that producers have a lack of openness regarding information. Regarding food safety, most consumers believed that manufacturers did not pay sufficient attention to or place adequate significance on the matter.

A commitment to recycling, a reduction in the use of disposable items, a preference for locally produced goods or brands sold at grocery stores, the purchase of products that are branded with an environmental label, and a deliberate attempt to reduce the amount of time spent driving their cars are all examples of environmentally friendly behaviors that customers have demonstrated.

Moreover, the logit model estimation results have validated the statistically significant impact of product certification on the consumers' willingness to spend extra money on those products. In addition, a rise in this willingness is related to age. This contradicts the findings of the first investigation, which suggested that there was a low statistical significance in the consumers' willingness to pay more for EFF in comparison to conventionally produced agro-food products. A number of variables were validated as statistically significant, including a greater emphasis on a good diet, perspectives that were positive towards EFF, as well as worries surrounding working hours, the effect of product labeling, and opinions regarding the knowledge and intentions of producers regarding safety. These results provide an insight into the preferences and behaviors of the consumers who were surveyed concerning environmentally friendly food choices.

The current study highlights the growing awareness among consumers about environmental and health concerns, which in turn impacts their choices for alternatives that are both environmentally friendly and devoid of substances that include pesticides. The findings of Dyck et al. [12] indicate that consumers are becoming more aware of the environmental and health risks involved with agricultural production and are also getting more worried about these risks. This is consistent with the more significant trend of consumers opting for environmentally friendly and sustainable products in their production and consumption systems. Specifically, the positive aspects of age and the importance consumers place on nutrition are significant factors influencing consumer behavior regarding willingness to pay a premium for environmentally friendly plant protection methods, as indicated by dichotomous regression analysis. Favorable attitudes and perceptions toward environmentally friendly products, flavors, and environmental labeling increase the likelihood of consumers paying a premium for such items. In addition, consumers who have favorable perceptions are more likely to pay a premium for these products.

On the other hand, a significant number of attributes have a detrimental impact on a consumer's readiness to pay. The nation of origin and education are the first of these factors. Lower levels of education are linked to a decreased willingness to spend, highlighting the crucial role of education in shaping consumer attitudes. Conversely, higher levels of education are associated with a greater desire to spend. Free time and indifference are also significant variables, as consumers with limited leisure time are indifferent to products that include pesticide residue, and consumers who lack information about products that contain pesticide residue are less likely to pay for them. This is probably a metaphor for busy consumers' challenges and the value of information in influencing their choices throughout their hectic lives.

The study underlines the relevance of education in terms of its power to affect the knowledge and behavior of customers, which reaffirms the results that [45] discovered. Since there is a link between more significant levels of knowledge and an increase in the desire to spend, consumers must make choices based on correct information. Furthermore, various criteria, such as economic parameters, circumstances specific to a country, and educational levels, all play a role in determining whether consumers are willing to support environmentally friendly habits. These results align with those of [35], who indicated that the socioeconomic context is one of the most significant aspects that play a role in determining the behavior of consumers.

The results of the consumer willingness-to-pay regression offer valuable insights into the complicated interaction of factors that impact purchasing decisions associated with food that is produced utilizing environmentally friendly plant protection. Age, positive attitudes, environmental awareness, and trust in producers seem to be good drivers. At the same time, economic worries, education levels, and traits peculiar to the nation appear to be obstacles. All the factors mentioned above present a comprehensive understanding of consumer behavior and show the necessity of concentrated awareness efforts, education initiatives, and regulatory measures to promote environmentally responsible agricultural methods and meet the ever-changing expectations of consumers. In terms of education, workshops and seminars on topics like sustainable farming practices, organic products, and the impact of agriculture on the environment, as well as the incorporation of agricultural education into school curriculums and the distribution of brochures, flyers, and booklets with information on different agricultural products and their benefits could be some examples. Further strategies to be adopted are related to labeling and certification, campaigns promoted on social media, as well as collaboration with influencers. Policy interventions could include initiatives that support agricultural education and the promotion of sustainable farming practices as well as public service announcements to inform consumers about the benefits of sustainable agriculture and responsible consumption, and collaboration with non-governmental organizations that focus on sustainability and agriculture to amplify the reach and impact of awareness campaigns. A final but certainly significant step that could be taken involves providing consumers with information on the origins and production methods of their food and implicitly promoting transparency in the supply chain. The combination of the above strategies could change the prioritization of the agro-food selection criteria for consumers, promoting sustainable agriculture.

5.2. Producers

Several factors significantly impacted the limited adoption of environmentally friendly technology, including efficacy, sufficiency, and knowledge levels. Farmers raised concerns about pesticide use, highlighting issues such as the availability of alternative pesticides, the impact on animals and the environment, and soil fertility.

Due to the selection criteria of effectiveness, price, prior experience, and health concerns, botanical pesticides emerged as producers' preferred alternative. The advent of other options that are less harmful to the environment coincided with a considerable movement toward using conventional pesticides. Price stability was highlighted as a primary factor in this transformation. Even though many farmers used environmentally friendly irrigation and growing processes and environmentally friendly agricultural products, there was less interest in adopting techniques connected to renewable energy sources and energy efficiency. This was the case, although there was much interest in adopting these techniques.

From the producers' point of view, it was challenging to ascertain the effect that implementing environmentally friendly practices would have on the money generated by agricultural production. Several vital characteristics contributed to the producers' desire to replace traditional commodities with environmentally friendly alternatives. These included education and age and the farmers' expectations of climate change's impact on agricultural earnings. The desire of farmers to replace conventional pesticides with alternatives that are less harmful to the environment was positively influenced by environmental and

economic factors; nevertheless, the high pricing of these alternatives proved a limiting factor throughout this process. Producers' awareness and concern about climate change's social and environmental repercussions influenced their decision to include environmentally friendly products in their production process.

Based on the research findings, it was suggested that it might be possible to replace conventional pesticides with less harmful alternatives to the environment if specific regulations were implemented to ensure that prices were reduced and if educational activities were implemented to promote awareness among growers. The main issue within the Green Deal involves a fast-track approval [55] for the low-risk products that are on the 2018 list, without waiting for the renewal of these substances, and the extension of their current use to crops (more in horticulture) and in IPM regimes [56]. In terms of stakeholders, the following are needed: financial incentives, providing training and information, recruitment of specialists, a faster approval track, and the sponsoring of research projects.

Several categories are brought to the forefront in analyzing the factors that influence the choice of pesticides. Producers pay attention to components that positively affect the health of the people and the environment. The significance of labeling and warnings on products throughout the decision-making process highlights the critical role of information that is open and accessible. Furthermore, economic factors, such as the effectiveness of pesticides, personal experience, and price, have a substantial influence. The prioritization of compounds that are reviewed based on their effect on health and the environment and the relevance of warnings and labels on packaging is matched with the improved awareness of the harmful repercussions of indiscriminate pesticide use. The emphasis on this subject aligns with other studies [27,40] that emphasize the shift toward environmentally conscious decision making.

Farmers are concerned about the potential negative impacts that an excessive number of chemical fertilizers and pesticides may have on the environment. As may be seen from the emphasis that is being put on environmental burden and water pollution, there is a heightened understanding of the more considerable ecological consequences that agricultural activities have. In addition, recognizing the positive outcomes, such as contributing to the preservation of natural resources and the protection of the environment, indicates a sophisticated understanding of agriculture's dual role in contributing to and relieving environmental problems. Previous studies have also reached the same conclusions [31,45,57].

In alignment with adopting climate change mitigation strategies, producers are committed to implementing environmentally friendly cultivation practices and using less polluting fertilizers and pesticides. More specifically, within the Green Deal Agreement, the adoption of low-risk pesticides of biological origin as an alternative to chemical pesticides in agriculture is a requirement in order to realize the Farm to Fork strategy target of a 50% decrease in the use of more hazardous pesticides by 2030 [58]. This objective can be achievable with measures taken by each member state, including financial incentives, training and information provisions, the recruitment of specialists, a faster approval track, and the sponsoring of research projects. Additionally, the role of demographics, socioeconomic conditions, and geographic factors in shaping acceptance levels of innovative practices is consistent across various studies.

The regression model delves into the determinants impacting producers' choices regarding adopting eco-friendly plant protection products over conventional pesticides. The results show a positive correlation between higher education levels and a greater inclination to adopt eco-friendly plant protection, highlighting the crucial role of education in environmentally conscious decisions. Additionally, a negative coefficient for age suggests younger producers are more likely to replace conventional pesticides, indicating a generational shift in preferences.

The viewpoints that farmers have on the impact that climate change might have on the profitability of agriculture represent an additional significant element that should be considered. It may be deduced that producers who are aware of the consequences of climate change are more likely to use techniques of plant preservation that are less harmful

to the environment. This highlights how essential it is to be conscious of climate change to establish agricultural practices responsible for the environment. Producers driven by economic viability and environmental sustainability will likely adopt eco-friendly plant protection methods. This reflects an international trend toward balancing economic and ecological considerations.

Even though environmental and economic incentives positively impact adoption, the model suggests that the higher costs connected with the maintenance of ecologically friendly plants are a factor that limits adoption. Consequently, this reflects producers' economic challenges while transitioning towards more sustainable practices, highlighting the need to find more cost-effective alternatives. There is a significant relationship between producers' knowledge and interest in the social and environmental implications of climate change and their decision making. Considering this, environmental consciousness and social responsibility play a significant role in the decision-making process within the agricultural sector. Producers' perception of their competence in food safety and certification is one of the variables that has a favorable influence on the customers' willingness to pay for the product. When it comes to altering the behavior of consumers, confidence in producers and their dedication to adopting environmentally friendly solutions are extremely significant considerations.

According to the concept, policy measures that aim to lower the number of barriers that inhibit adoption are the ones that should be pushed for. Possible steps to facilitate the transition to environmentally friendly plant care would be to decrease expenses while simultaneously boosting the level of knowledge and awareness among farmers. When it comes to developing and implementing such measures, policy makers are strongly urged to consider the socioeconomic context, which encompasses a variety of characteristics like education level, age, and economic circumstances. The results emphasize the crucial role of farmer education in understanding pesticide consumption consequences and promoting sustainable practices, coinciding with the arguments of [45].

In line with [35], it is widely acknowledged that the socioeconomic characteristics of a region play a significant role in determining the degree to which eco-friendly behaviors are accepted. The effect of geographical location and climatic conditions on farmers' willingness to apply integrated pest management (IPM) techniques aligns with previous research findings [38,39], particularly in the same region, as indicated by the present study. Small-scale producers are more reluctant than larger producers, often due to a lack of technical expertise and financial resources.

The study's results highlight the necessity of implementing interventions tailored to the specific environment in which they are being applied. Additionally, it is essential to emphasize that the model acknowledges the complexities and challenges inherent in migrating to new plant protection measures, consistent with the studies of [59,60].

Considering all the criteria mentioned above, the findings offer valuable insights into the plethora of antecedents that affect producers' adoption of environmentally friendly plant protection products. Obviously, the issues of education, knowledge, economic concerns, and measures taken by the government are all significant factors. Policy makers are encouraged to devise solutions to these issues to establish a sustainable and environmentally friendly agricultural sector. The model's alignment with past research highlights the need for coordinated efforts to promote eco-friendly agricultural practices and tackle global pesticide-related problems, contributing to the robustness of the findings. As it pertains to the process of policy implementation, which entails transforming the objectives of a policy into concrete acts, practices, and regulations, several processes need to be carried out to ensure that the policy is successfully executed and that the desired results are achieved.

6. Conclusions

The objective of the current study was to stress the socioeconomic conditions and the degree of acceptance of innovative tools by end-users (consumers, producers), as well as to develop proposals for public awareness of environmentally safe plant protection tools.

Using microorganisms and molecular tools may raise concerns among the public, similar to those against transgenic and genetically modified organisms.

It was found that consumers' willingness to pay more for food produced using environmentally friendly methods increases with age, length of time working, positive attitudes towards such foods, taste, and labeling of products for the use of environmentally friendly methods, and their perception of farmers' attitudes and knowledge of food safety issues. As for the producers, their decision to use environmentally friendly pesticides (EFP) over conventional ones is determined by demographic characteristics, their perception and interest in the social and environmental impacts of climate change, along with environmental and economic reasons.

On the one hand, consumer viewpoints provide significant insights into how the public perceives and interacts with pest management products. In contrast, producer surveys can provide important information about their preferences, concerns, and perceptions of plant protection tools. Consumer views and preferences are fluid and evolve, influenced by geographic location and personal beliefs. Producers may have different opinions and preferences depending on the crop they grow and the climatic conditions of their region. Hence, comprehensive and objective data analysis from various sources is necessary to derive accurate conclusions about consumer trends and viewpoints on pest control products and broader conclusions about producers' views and preferences on plant protection tools. The above-mentioned results necessitate policy makers to convey sustainability information to consumers in a transparent, evidence-based, and controlled way.

A limitation of this study could be the fact that the survey was conducted only in Greece out of the member project contributors and the small number of farmers that responded to the questionnaires. In the framework of the INTOMED project (intomed.bio.uth.gr), the same survey could be conducted in the participating countries and therefore be the subject of future work. The specific work could unveil similarities and differences among Mediterranean countries concerning the same crops and how different strategies and policy measures adopted could promote sustainable agriculture under the main objective of the Green Deal, which serves as the Bible for the future of agriculture, on the demand side as well as the supply side.

Author Contributions: Conceptualization, M.P. and K.P.; Methodology, A.K. and E.Z.; Software, A.K. and E.Z.; Validation, C.K. and E.Z.; Formal analysis, E.Z.; Data curation, A.K.; Writing—original draft, A.K.; Writing—review & editing, C.K. and E.Z.; Visualization, K.P.; Supervision, C.K. and K.P.; Project administration, M.P. and K.P.; Funding acquisition, M.P. All authors have read and agreed to the published version of the manuscript.

Funding: This project was funded by the General Secretariat for Research and Technology of the Ministry of Development and Investments under the PRIMA Programme. PRIMA is an Article 185 initiative supported and co-funded under Horizon 2020, the European Union's Programme for Research and Innovation (PRIMA2018-04).

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: Data are contained within the article.

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

Appendix A. Demographics of Survey Respondents

Table A1. Demographic profile of consumers.

Profile	Frequencies	Percentage (%)
Gender		
Male	**216**	**44.9**
Female	**244**	**50.7**
Other	**16**	**3.2**

Table A1. *Cont.*

Profile	Frequencies	Percentage (%)
Income Level (Euros per Month)		
<500	**66**	**13.7**
501–1000	**96**	**20.0**
1001–1500	**105**	**21.8**
1501–2000	**98**	**20.4**
2001–2500	**61**	**12.7**
2501–3000	**14**	**2.9**
3001–3500	**17**	**3.5**
3501–4000	**10**	**2.1**
4501–5000	**2**	**0.4**
>5001	**2**	**0.4**
Age		
18–25	**218**	**45.3**
26–35	**88**	**18.3**
36–45	**106**	**22.0**
46–55	**56**	**11.6**
56–65	**9**	**1.9**
Employment Status		
Full-time Employment	**239**	**49.7**
Part-time Employment	**97**	**20.2**
Unemployed	**140**	**29.1**
Household Size		
0	**6**	**1.2**
1	**32**	**6.7**
2	**110**	**22.9**
3	**107**	**22.2**
4	**147**	**30.6**
5	**53**	**11.0**
6	**8**	**1.7**
Number of Children (Under 18)		
0	**281**	**58.4**
1	**69**	**14.3**
2	**72**	**15.0**
3	**5**	**1.0**
Number of Individuals (Over 65)		
0	**357**	**74.2**
1	**51**	**10.6**
2	**8**	**1.7**
3	**2**	**0.4**

Table A1. *Cont.*

Gender	Frequency	Percentage %
Occupation		
Private Employee	**102**	**21.2**
Public Employee	**105**	**21.8**
Self-employed	**45**	**9.4**
Unemployed	**23**	**4.8**
Student/Scholar	**175**	**36.4**
Farmer	**15**	**3.1**
Retired	**7**	**1.5**
Homemaker	**5**	**1.0**
Marital Status		
Married	**156**	**32.4**
Single	**197**	**41.0**
Divorced	**27**	**5.6**
Widowed	**3**	**0.6**
In a Relationship	**93**	**19.3**
Education Level		
Elementary	**9**	**1.9**
Secondary (High School)	**87**	**18.1**
University/Technical School	**266**	**55.3**
Postgraduate	**97**	**20.2**
Other (PhD)	**15**	**3.1**

Table A2. Demographic characteristics of producers.

Gender	Frequency	Percentage %
Male	55	72.4
Female	19	25.0
Age		
18–20	10	13.2
21–29	18	23.7
30–39	19	25.0
40–49	14	18.4
50–59	15	19.7
Education		
Primary School	3	3.9
Secondary School/High School	21	27.6
University/Technical School	31	40.8
Postgraduate/PhD	21	27.6

Table A2. *Cont.*

Gender	Frequency	Percentage %
Marital Status		
Married	55	72.4
Single	3	3.9
Divorced	2	2.6
Widowed	1	1.3
In a Relationship	15	19.7
Household Members		
1	3	3.9
2	17	22.4
3	12	15.8
4	14	18.4
5	13	17.1
6	1	1.3
Annual Income		
<10,000	4	5.3
10,000–20,000	57	75.0
20,001–30,000	7	9.2
>40,000	8	10.5
Production Cost		
<50%	48	63.2
50–80%	23	30.3
80–100%	5	6.6
Cooperative Members		
Yes	29	38.2
No	47	61.8
Other Local Association		
Yes	16	21.1
No	60	78.9

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