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Consumers' Benefit—Risk Perception on Pesticides and Food Safety—A Survey in Greece

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Abstract: Pesticides are widely used to protect agricultural products from pests and diseases. Although a strict regulatory framework exists in the EU, concerns about pesticide residues in food are retained among consumers. This study represents the first large sample (N = 1846) attempt to identify the main predictors influencing Greek consumers' attitude concerning the benefits—risks ratio of pesticide use. After a principal components analysis and a bivariate logistic regression were performed, it was found that Greek consumers express high concerns from pesticide residues in food regarding their loved ones and their own health. At the same time, however, they recognize to a significant extent beneficial contributions of the use of pesticides to food security and the national economy, as well. Several significant predictors of consumer's attitude towards benefit—risks perception of pesticide use was identified, concerning personal values, pesticide user status, gender, confidence in controlling and certification procedures, and received information. Our results suggest that efforts for risk communication are needed to address food safety issues targeting the general public.

Keywords: consumer's attitudes; pesticide residues; risk-benefit ratio; principal components analysis; logistic regression; cluster analysis

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1. Introduction

Pesticides are used in many areas of agriculture to improve yield and product quality [1]. The positive outcomes of the rational use of pesticides have been extensively reviewed by Cooper & Dobson (2007) [2], who pointed out that pesticides make our lives better, provided they are regulated and used in such a way that the benefits significantly outweigh the risks. The most featured contribution of pesticide use is the reduction of food losses due to crop pests and diseases [3–5], especially in developing countries where pre- and post-harvest losses have an impact on poverty and malnutrition [6,7].

The public health risks from dietary exposure to pesticide residues is highly controversial because the significance of their presence in the diet is difficult to evaluate [1,8]. Most of the studies related to the human health effects of pesticides deal with occupational exposure [9]. Nevertheless, concerns have been expressed about the potential negative effects of pesticides on the health of the general population via dietary exposure. Several studies have shown the neurotoxic [10] and cytotoxic effects [11] of pesticides and their activity in gene mutation, chromosomal damage, and DNA damage effects [12]. Population studies have revealed possible links between exposure to pesticides and severe health effects, including cardiovascular disease, negative effects on the male reproductive system and nervous system, dementia, a potential increased risk for non-Hodgkin's lymphoma [13], as well as a possible role in colorectal carcinoma etiology [14]. There is also suggestive evidence for pesticides increasing Parkinson's disease risk [15]. It has been shown that the dietary intake of

pesticides represents the major source of exposure in urban/suburban young children and a great concern has been raised about the children's health because of their susceptibility to possible neurologic and neurodevelopmental effects [16–19]. Bourguet and Guillemaud (2016) [20] have argued that the cost of pesticide use has outreached the benefits. However, concern has been expressed that few of the health effects that have been associated with pesticides can be classified as causal [9]. In addition, concerns have been raised about the simultaneous presence of multiple pesticide residues in food [11,21]. However, Hernández and Lacasaña (2017) [22] concluded that synergisms at dietary exposure levels are rather rare and cannot be predicted quantitatively based on the toxicity of the mixture components. After the recently published retrospective cumulative risk assessments of dietary exposure to residues in 2014, 2015, and 2016 of pesticides that have acute effects on the nervous system [23] and chronic effects on the thyroid [24], the European Food Safety Authority has concluded that, with varying degrees of certainty, cumulative dietary exposure does not reach the threshold for regulatory consideration for all the European population groups examined. After all, research on the health benefits of fruit and vegetable consumption has demonstrated that they significantly outweigh the pesticide residues' estimated risks [25].

There is, therefore, still high uncertainty about the health effects of pesticides in research, and reliable information about pesticides and health can scarcely reach lay people [10]. Additionally, the role of pesticides in sustainable food production is barely discussed with the public [26]. Consequently, the ratio of risks versus the benefits of pesticide use will continue to be a matter of public concern, and the consumers' perceived risks will deviate from the estimations of Regulatory Authorities based on facts [2,27,28] and following specific risk assessment procedures [29]. It is, therefore, inevitable that pesticide residues in food generate high levels of perceived risks [30,31].

Perceived risk is a function of subjective uncertainty perceived by the consumer. Consumer risk perception tends to give greater weight to the perceived potential severity of unhealthy food than the probability of exposure [28]. It has been shown that consumers perceive relatively high risks associated with the consumption of conventionally grown agricultural produce, particularly pesticide-related risks [32]. Besides, health benefits are among the most important factors motivating the purchase of organic food products [33].

Yeung and Morris (2001) [28] stated that chemical hazards tend to be rated relatively high on the "unknown" factor because people view these as unnatural and unfamiliar. People very often attribute high risks to food products if they have less knowledge of chemical or technological processes. Individuals perceive greater control over biological food risks than chemical/technical risks [34]. The tolerance of risk is positively correlated with the perceived benefit; the bigger the benefit, the greater the willingness to take risk [28]. Perceived control and benefit perceptions are negatively associated with food safety risk perception. On the contrary, consumers who prefer natural food and those who are more concerned about their food perceive more food safety risks [35].

Risk perception and purchase behavior are causally linked: the former is an important explanatory variable of the latter. Some consumers are willing to pay marginally higher prices for quality assurance and, hence, reduced risk in food, especially during periods of safety concern [28]. Many studies have previously investigated the consumers' willingness to pay for pesticide-free products. It has been shown to be influenced by factors such as female gender, younger age, shopping at health food stores, as well as concern about pesticides, health, and sustainability issues [36–39].

Trust of the stakeholders [40] and the official Authorities and confidence in the safety of the food supply are significant predictors of the consumers' food safety risk perceptions [32,34]. In modern industrialized societies, people outside of the food production chain rely on institutional actors to protect the safety of their food, although the effect of trust on food risk concerns varies substantially across European countries [34]. Government agencies seem to lack credibility among consumers, and consumer confidence in the adequacy of government regulations on pesticide use has decreased dramatically [32,34,41]. Han et al. (2020) [42] have found that the monitoring of pesticide residues and control

procedures significantly reduce people's negative perceptions of food safety. It has been suggested that risk communication efforts designed to educate consumers about food safety issues need to further include issues related to the credibility of regulatory procedures and information sources [32], as well as appropriate information dissemination systems, to bridge the gaps between regulators and the general public [42].

Harris et al. (2001) [43] stated that the perception of the risk of pesticide residues by consumers has always been affected by emotional input, which is something that possibly accounts for any exaggeration upon new information [9]. Risk perception of food is most commonly affected by cognitive processing of information provided by third parties and deliberations related to the individual's condition [44].

The media play a critical role in risk communication [45]. Effective risk communication should contain information on the nature of the risk and the benefits, uncertainties in risk management, and risk management options [46]. The consumers' attitudes and risk perceptions towards food safety are influenced by the media [34,47]. Risk amplification by the media has been thoroughly discussed in the literature [45]. Massive media coverage is more likely to heighten the perception of risk and demand for action to alleviate the perceived risk [28]. Food risks are often covered by the media according to factors that are more suited to the criteria for making the news than to the way in which experts rank food risks [48]. According to Kehagia & Chrysochou (2007) [49], Greek media are sensitive in uncovering a great deal of information about food hazards to the public. They concluded that the media coverage of food hazards considering pesticide residues in food were characterized by alarming content with a tendency to exaggerate the potential risk. On the contrary, exposure to media has been associated with better knowledge on the regulatory aspects of pesticides and, consequently, lower reported levels of perceived risks [50].

Consumer attitudes towards food safety differentiate according to sociodemographic factors [51]. Gender is a good predictor of risk perception. Females seem to perceive more food safety risks than males. Marriage status also increases the likelihood of concern [34,52,53]. The effect of children on food risk concerns may be significant [52] but not always [34,53]. Young, well-educated, and female urban residents perceived greater risks to food safety than other groups [42]. As education increases, respondents report significantly fewer concerns about biological risks, but greater concerns about chemical/technical risks [34].

Several previous studies have recorded the attitudes and perceptions of Greek consumers regarding the willingness to pay more money to buy safer food from brands that provide information. Karagianni et al. (2003) [54] have shown that consumers in Greece consider the absence of pesticide residues from the fruits and vegetables they purchase as a very important parameter. Females, as well as those who had knowledge of the HACCP certification system were more concerned about chemical residues. A high willingness to purchase certified fruits and vegetables has also been demonstrated [55]. Tsakiridou et al. (2006; 2008) [56,57] have shown that Greek consumers who are interested in chemical residues in food express a greater willingness to buy organically produced products. In addition,, it has been shown that both attitudes toward consuming safer food and the presence of traceability affect Greek consumers' willingness to buy certified food [58–61], with labeling acquiring special significance as a means of helping consumers assess the quality of food products [61–63]. Information is an important risk reliever. Consumers wish to acquire more information if there are uncertain outcomes for purchasing decisions, and product traceability has been a key issue in this respect [28].

Making the EU food supply chain "from farm to fork" more sustainable is at the heart of the European Green Deal. One of the main purposes of this fundamental shift in the EU food and agriculture policy is the targeted 50% reduction in the use and risk of chemical pesticides by 2030 [64,65]. As criticism regarding the strategy is not lacking concerning agricultural production, competitiveness and social welfare [66], there is a need for additional information on the general public's perceptions regarding pesticide use. The

present work aimed to improve our knowledge about the Greek consumers' beliefs, the predictor variables associated with personal attitudes and views, as well as socioeconomic characteristics that might influence them, addressing the question of the ratio between the benefits of pesticides versus their potential risks. In this area, information on the general public's perceptions is scarce. In this respect, the research in this paper was undertaken aiming to answer the following research questions:

RQ1: What are the Greek consumers' views towards the issue of whether the benefits of pesticide use outweigh their potential risks;

RQ2: What sociodemographic and attitude variables predict the Greek consumers' personal views towards the benefits versus the potential risks ratio of pesticide use.

2. Materials and Methods

The study was conducted through a web-based survey. The data collection was facilitated using a questionnaire posted on the Google Forms platform (https://www.google.com/forms/ (accessed on 31 March 2021). The survey questionnaire was sent via email, through Viber and Facebook's Messenger applications to approximately 9100 recipients, while it was also disseminated by articles in online news fora and magazines. Through the duration of the survey, 1846 completed questionnaires were obtained, which indicates a survey response rate estimated at 20%. The purpose of this survey was exploratory in nature, since no prior study was conducted using a large, nationwide sample to inquire about the Greek general population's attitudes towards the research questions.

The survey, undertaken between 6th March and 31st March 2021, aimed to investigate the beliefs, perceptions, and feelings of the general consumers' audience on pesticides, pesticide residues, and food safety in Greece. The questionnaire was designed based on previous consumer opinion studies on food safety [36,41,50,58]. It included 5-point Likert-scale closed questions regarding the participants' perceptions or attitudes. The response levels for the Likert scale were: 1 = totally disagree, 2 = partly disagree, 3 = neither disagree/nor agree, 4 = partly agree, 5 = totally agree, or, 1 = never, 2 = rarely, 3 = occasionally, 4 = frequently, and 5 = habitually, depending on the case. The questionnaire was divided into two sections: (a) sociodemographic data and (b) respondents' views. The personal views questions related to the participants' beliefs regarding statements on the positive contributions of pesticides to food production and the national economy, the pesticide proper application, and the necessity of their use. The questions also related to their views and concerns regarding plant food safety and consumer health, pesticide residue official control, food traceability, and certification issues, as well as specific diet habits. In addition, they related to their worries regarding their own health and other people's. Finally, questions regarding the participants' information sources were included. The specific items of the questionnaire are presented in Appendix A, Table A2.

In order to describe the characteristics of the sample and to present the results of the survey, the data collected from the questionnaires were initially subjected to descriptive statistical analysis. The median was used as the appropriate central tendency measure to present and interpret the results of the questionnaire, following Skarpa and Garoufallou (2021) [67]. The non-parametric Kruskal–Wallis test was performed to test differences in the ordinal variables.

A principal components analysis (PCA) was performed to identify the underlying information structure contained in the original interrelated variables and to summarize it into a smaller set of composite variables. An eigenvalue criterion greater than 1 was used as a cut-off point for the number of principal components (PC) retained. After oblique (promax) rotation was performed, the rotated loadings (eigenvectors) portrayed a much more simplified PC-loading pattern with each variable loading (correlating) substantially only to a single PC. In the final analysis, only variables with loadings > 0.6 were retained. The appropriateness of PCA was tested performing the Kaiser–Meyer–Olkin (KMO) test, which takes values ranging from 0 to 1, as a measure of sampling adequacy, and the

Bartlets's test of sphericity, a significant result of which indicates that at least some pairwise correlations among variables are not equal to 0 [68].

The McDonald's ω reliability coefficient of internal consistency for the scale variables [69] loading on a single PC was calculated and reported. In order to get a single measure of each PC, variables loading on a single PC were combined using composite scores for further analysis [68].

Binary logistic regression was performed to identify any potential predictors concerning the participants' views about the overall benefits of pesticides upon their risks, as the dependent variable. Sociodemographic variables and PCs retained from the PCA were involved as possible predictors in the model. Odds ratios (OR) and 95% confidence intervals (CI) were calculated and presented. The Wald test of statistical significance for each of the independent variables in the model was performed. Finally, performance metrics such as specificity and sensitivity, which presents the proportions of true-negative and true-positive observations predicted by the model, respectively, along with AUC (area under the ROC curve portraying the trade-off between true positive rate versus false positive rate) which is an overall test of predictive accuracy and indicates the amount of discrimination between true-positive and false-positive values of the estimated model, were calculated and presented. A large AUC (>0.5–1) indicates better model fit [68].

For the purpose of performing logistic regression analysis, variables of participants' views were split into two levels with a binary outcome: "in favor" = 1, after grouping together the Likert response levels "partly agree" and "totally agree," and "not in favor" = 0, after grouping the Likert response levels "totally disagree," "partly disagree," and "neither disagree/nor agree," following Skarpa & Garoufallou (2021) [67].

A non-hierarchical k-means cluster analysis was performed in order to proceed with the partition of participants into groups based on similarity for a set of user selected characteristics. The aim was to determine structures that adequately summarize the data in order to identify groups of consumers with similar attitudes towards pesticide use. The analysis was based on the PC's that had been previously retained from PCA as clustering variables that related to consumer's perceptions [44]. To further characterize the clusters and to investigate any significant differences between the clusters, the Chi-squared test of association and Mann-Whitney U tests were conducted for variables with nominal and ordinal outcomes, respectively.

The analyses were carried out using the open-source statistical analysis software "Jamovi 2.0.0" using the R programming language [70].

3. Results

3.1. Characteristics of Survey Participants

A total of 1846 participants replied to the questionnaire, from all Greek Regions. The target population under investigation is defined as consumers of plant food, aged 18 to over 65 years old, and residents of both urban and rural areas from all over Greece (Continental and the Islands). In Appendix A, Table A1, the sociodemographic characteristics of the survey participants are presented. Both genders were represented adequately (females 48.5%), as well as all age groups. Most subjects (45.1%) were living in southern Greece, with 26.6% in Central and 29.3% in Northern Greece. For the purpose of the analyses, the age groups were reduced to three, following Miles et al. (2004) [53], and the distribution of the participants among the three main age groups included 22.5% who were ages 18–34, 58.1% who were ages 35–54, and 19.4% who were ages $\geq$ 55 years old. The vast majority of participants had at least a high school educational level and were mainly civil servants (44.1%), private employees (18.6%), self-employed persons (12.1%), university students (11.7%), and farmers (5.3%). Additionally, several individual habits were recorded concerning free personal time, smoking, sports habits, and vegetarian attitude (Appendix A, Table A1).

Participants were offered a sub-set of questions regarding their specific consuming habits in recent years. The frequency distribution of the responses is presented in Table 1. Participants tended to hold positive attitudes towards eating fruits and vegetables. Specif-

ically, data analysis showed that, in central tendency terms of the distribution of replies, respondents frequently consumed "*Fruits and vegetables*" and followed the "*Traditional Greek cuisine*" (median 4, IQR 1). On the contrary, they seemed to rarely consume "*Organic*" (median 2, IQR 1) or "*Produced-by-themselves, fruits and vegetables*" on the central tendency level (median 2, IQR 3). Finally, respondents declared that they occasionally consumed "*Products of certified origin*" (after Protected Designation of Origin or Protected Geographical Indication certification) (median 3, IQR 2). These specific consuming habits, among other sociodemographic factors, along with principal components retained from the PCA have been taken into account below in a binary logistic regression analysis in order to investigate the presence of predictors of participants' willingness to accept the perceived benefits of pesticides over their perceived potential risks.

Table 1. Special consumption habit of the respondents (N = 1846).

Consumption Habits	Median (IQR) [1]		Frequent to Habitual Consumption
I consume fruits and vegetables	4 (1)	"Frequently"	79.5%
I follow the traditional Greek (Mediterranean) cuisine	4 (1)	"Frequently"	80.6%
I consume organic fruits and vegetables	2 (1)	"Rarely"	20.9%
I consume products of certified origin (PDO, PGI)	3 (2)	"Occasionally"	34.2%
I consume products of my own cultivation	2 (3)	"Rarely"	26.2%

3.2. The Participants' Views towards the Benefits versus Risks of Pesticide Use Research Question

The frequency distribution of participants' replies to the question under investigation, concerning their views about whether or not the benefits of pesticides outweigh their potential risks (*RQ1*), was obtained as follows: Totally disagree (med. = 1): N = 283 (15.33%); disagree (med. = 2): N = 463 (25.08%); neither disagree/nor agree (med. = 3): N = 269 (14.57%); agree (med. = 4): N = 634 (34.35%); totally agree (med. = 5): N = 197 (10.67%). The median of the replies' distribution is equal to 3 (IQR: 2), which implies neither disagreement, nor agreement to the statement in central tendency terms. Nevertheless, a significantly higher proportion of unfavorable responses were found, tested against the null hypothesis that the two categories are equally likely ($p = 0.50$). After splitting the response rates into two levels with a binary outcome, i.e., "*in favor*" and "*not in favor*", a binomial proportion test was applied. The proportion of "not in favor" replies was 0.550 (CI: 0.527–0.573), N = 1015 and the corresponding proportion of "in favor" responses was 0.450 (CI: 0.427–0.473), N = 831 ($p < 0.01$).

3.3. The Variables Predicting the Participants' Attitudes towards the Benefits versus Risks of Pesticide Use Research Question

In order to investigate the sociodemographic and ideological variables that could possibly be found as significant predictors of the Greek consumers' views towards the benefits versus the potential risks ratio of pesticide use (*RQ2*), a principal components and a logistic regression analyses were performed.

3.3.1. Principal Components Underlying the Participants' Attitudes

A principal components analysis was performed to identify the structure of relationships among variables of the original data. Twenty -ive original variables were analyzed having loadings greater than 0.6. Seven principal components (PC) were retained applying the eigenvalue criterion, having substantial amounts of common variance, and considered appropriate to adequately represent the underlying structure in the data (Appendix A, Table A2). The explained cumulative variance was 61.7%. Reliability coefficients (McDonald's ω) varied between 0.634 and 0.865. All PC's had sum of the squares loadings (eigenvalues) greater than 1.0. Both Bartlett's test of sphericity ($p < 0.001$) and the KMO Measure of Sampling Adequacy (0.829) suggested suitability of the correlation matrix for a principal components analysis.

The first PC summarizes variables representing "*Specialized information sources*" (SINF) used by participants to get informed about pesticides, consists of four variables explaining 18.757% of variance. Official websites, public bodies newsletters, scientific journals and

agronomists as information sources were variables mostly correlating to the first PC. After analyzing the median scores of the respondents' replies to the variables loading in SINF, it was obvious that "*Agronomist*" (med.: 4; IQR 2) is the most frequent specialized provider of information on pesticides. Participants views on pesticides' contribution to the national income and to increased food production, as well as on the statements that pesticides' proper application ensures the user, or the consumer, were variables that were loading to the second PC. Accordingly, this is associated with "Perceived contributions of pesticides" (CONTR) and explains 11.377% of the variance. The printed and electronic Press as well as television and radio as sources of information on pesticides were variables loading to the third PC, namely "General information sources on pesticides" (GINF), that explains 8.438% of the variance. The participants' views on statements related to the safety of food of plant origin, the consumer's safety from the consumption of fruits and vegetables, as well as the pesticide residues official controlling procedures, all were correlated to the forth PC. This is labeled as "*Confidence in plant food safety*" (SAFE) and explains 7.175% of the variance.

The existence of labeling and traceability information that accompanies the food, and the safety of certified and integrated farming management food products were variables loading to the fifth PC. This is labeled as "*Confidence in food certification procedures*" (CERT) and explains 6.232% of variance. The sixth PC consisted of variables representing "*Perceived threats of pesticides*" (THR), which explains 5.598% of the variance. Participants' attitudes about their health status related to pesticides, worries about their health from pesticide residues in food, and feeling insecure about the health of their own people, were all loading in THR. Finally, "*Special plant food consuming habit*" (CONS) related to the Greek (Mediterranean) cuisine adoption, as well as fruits and vegetables consumption are loading to the CONS, which explains 4.078% of the variance.

The relationship among the seven PCs is summarized in Figure 1. Perceived threats (THR) load in the opposite direction in the horizontal axis and is negatively correlated with perceived pesticides' contributions (CONTR) and consumers' confidence in plant food safety (SAFE). It is also essentially orthogonal to specialized information sources (SINF) and confidence in food certification procedures, (CERT) which implies a negative relationship.

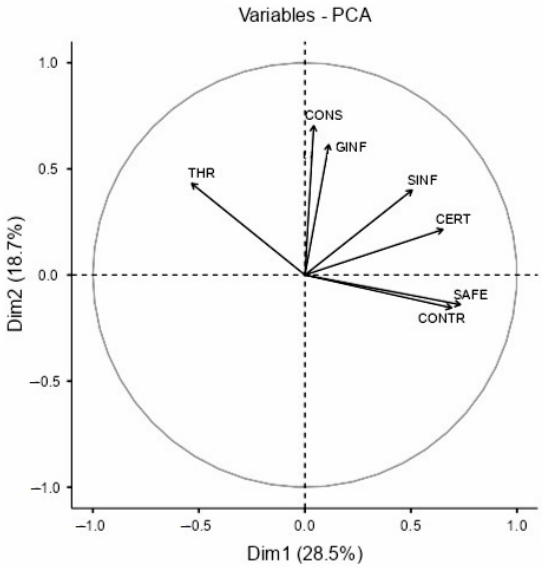

Figure 1. Principal components analysis graph depicting the relationship among PCs. SINF: Specialized information sources; CONTR: Perceived pesticides' contributions; GINF: General information sources; SAFE: Confidence in plant food safety; CERT: Confidence in food certification procedures; THR: Perceived pesticides' threats; CONS: Special plant food consumer habits.

3.3.2. The Existence of Predictive Variables of Participants' Attitudes–Logistic Regression Model

A binary logistic regression analysis was performed to identify the existence of any variables predictive of the participants' attitude concerning the use of pesticides. Specifically, the question about participants' views on the statement that "*there are more benefits from pesticide use against the risks*" is considered as the dependent variable. A preliminary logistic regression analysis using a stepwise method revealed that no sociodemographic variables significantly contributed to the model (the Wald test result was not significant), except for the "gender" and the "habit of using pesticides" variables (data not shown). Along this line, it was chosen to present a binary logistic regression analysis using an enter method concerning the "*gender*", the "*habit of using pesticides*", as well as the seven principal components previously retained from the PCA as possible predictors in the model.

The performance measures of the model, specificity (% of cases correctly predicted as not having the outcome) and sensitivity (% of cases that had the outcome correctly predicted) are 81.3% and 74.7%, respectively. The overall predictive accuracy of the model as measured by the AUC value (area under the ROC curve) is 0.855, which is considered very good for the model fit (Appendix A, Table A3).

The regression coefficients for "Specialized information sources" (b = 0.176; $p = 0.012$), "Perceived pesticides' contributions" (b = 1.343; $p < 0.001$), "General information sources on pesticides" (b = 0.156; $p < 0.012$), "Confidence in plant food safety" (b = 0.339; $p < 0.001$), "Confidence in plant food certification procedures" (b = 0.143; $p = 0.038$), "Users of pesticides" (b = 0.745; $p < 0.001$), and "Male gender" (b = 0.489; $p < 0.001$) are positive and statistically significant. This indicates that the probability of respondents intending to accept the benefits of using pesticides against their potential adverse effects was higher for those who were informed about pesticides most frequently by "Specialized" or "General information sources" those who declared a higher intensity of views regarding "Perceived pesticides' contributions", and showed greater "Confidence in plant food safety" and "Confidence in plant food certification procedures" followed by those who were "Users of pesticides" and, finally, "Males".

According to the odds ratios, the odds of a participant considering that the pesticide use poses "more benefits than risks" change by a factor of 3.83 (95% CI: 3.21–4.57) with each unit increment in their propensity towards "*Perceived pesticides' contributions*", 1.71 (95% CI: 1.30–2.25) towards "*Using of pesticides*", 1.49 (95% CI: 1.16–1.91) if they are "*Males*", 1.40 (95% CI: 1.22–1.61) towards "*Confidence in plant food safety*", 1.19 (95% CI: 1.04–1.47) with each unit increment in their frequency to get informed about pesticides by "*Specialized information sources*", 1.17 (95% CI: 1.03–1.32) by "*General information sources*", and finally, 1.15 (95% CI: 1.01–1.32) towards "*Confidence in plant food certification procedures*".

The regression coefficient for "*Perceived pesticides' threats*" and "*Southern Greece geographic region*" are negative and statistically significant (-0.286; $p < 0.001$ and -0.302; $p = 0.039$, respectively), indicating that respondents with a high perceived threats of pesticides and Southern Greece residents are less likely to accept the benefits of pesticides against their potential adverse effects. The odds ratio for these predictors indicates that the odds of a respondent viewing that there are "*more benefits than risks*" from pesticide use changes by a factor of 0.752 with unit change towards "*Perceived pesticides' threats*". Additionally, it changes by a factor of 0.739 for residence in Southern Greece. A prominent difference among Greek geographic regions was that participants who were residents in Southern Greece expressed significantly higher intensity of perceived threats, compared to Central and Northern Greece counterparts, after performing the Kruskal–Wallis test (df = 2; W = 3.777; $p = 0.021$ and df = 2; W = 4.885; $p = 0.002$, respectively).

Respondents' declarations on "*Special plant food consumption habit*" did not constitute a significant predictor of their views on the statement that there are "more benefits than risks" from pesticide use (Wald test, $p = 0.969$); therefore, this component is not supported in the model.

3.4. Cluster Analysis of the Respondents

The cluster analysis was based on the principal components relating to consumer's perceptions that were retained from the PCA. A two-cluster solution was obtained for further analysis. To characterize the participants' perceptions regarding pesticide use among Clusters, the Mann-Whitney U test was performed (Table 2). Cluster 1 (N = 812) was labeled as "*Supporters of pesticide benefits over the threats*" as it was comprised of participants with greater intensity of views towards perceived pesticides' contributions ($p < 0.001$), with a higher frequency of being informed about pesticides by specialized information sources ($p < 0.001$) and expressing greater confidence in plant food safety ($p < 0.001$). Cluster 2 (N = 1034) consists of participants with a greater intensity of the perceived threat of pesticides ($p < 0.001$), with a lower frequency of being informed about pesticides ($p < 0.001$) and expressing lower confidence in plant food safety ($p < 0.001$). For this reason, Cluster 2 was labeled "*Non-supporters of pesticide benefits over the threats*". The sociodemographic profile of the clusters was made using the Chi-squared test of association as shown in Table 3. Cluster 1 is characterized by a greater proportion of male respondents ($p < 0.001$) and pesticide users ($p < 0.001$) compared to Cluster 2. Furthermore, farmers, retired, and self-employed persons are represented with significantly higher proportions in Cluster 1. On the contrary, significantly greater proportions of females ($p < 0.001$), civil servants, private employees, unemployed persons, and university students ($p < 0.001$), as well as urban residents ($p = 0.017$) are classified in Cluster 2. Participants' special plant-food consuming habit, residential geographical regions, age, and educational level did not differ significantly between the Clusters.

Table 2. Median values of perceptions on pesticides and information sources attributes according to clusters of respondents concerting benefits—threats of pesticides.

	Cluster 1 (N = 812)	**Cluster 2 (N = 1034)**	**Mann-Whitney U Test**
	"Supporters"	**"Non-Supporters"**	
PRINCIPAL COMPONENTS	**MEDIAN (IQR) ***	**MEDIAN (IQR)**	
PC 1: Specialized information sources on pesticides	4 (2) [a]	3 (2) [b]	W = 189,516; $p < 0.001$
PC 2: Perceived pesticides' contributions	5 (1) [a]	4 (1) [b]	W = 148,057; $p < 0.001$
PC 3: General information sources on pesticides	3 (1) [a]	2 (2) [b]	W = 381,959; $p < 0.001$
PC 4: Confidence in plant food safety	4 (0) [a]	3 (1) [b]	W = 112,711; $p < 0.001$
PC 5: Confidence in plant food certification procedures	4 (1) [a]	4 (1) [b]	W = 183,623; $p < 0.001$
PC 6: Perceived pesticides' threats	3 (2) [b]	4 (2) [a]	W = 204,718; $p < 0.001$
PC 7: Special plant food consumption habits	4 (1)	4 (1)	W = 410,625; $p = 0.419$

*: Median values as a central tendency measure of the participants' replies distribution of each principal component between clusters and in brackets the interquartile range as a variability measure. [a, b]: Partitioning of principal components' median values among clusters followed by different letter differs statistically significantly at 0.001 level.

Table 3. Sociodemographic characterization of the two obtained clusters of respondents.

NOMINAL VARIABLES		Cluster 1 (N = 812)	Cluster 2 (N = 1034)	Chi-Squared Test
		"Supporters"	"Non-Supporters"	
GENDER	Female	35.4%	64.6%	$X^2 = 52.4$; df = 1; $p < 0.001$
	Male	52.1%	47.9%	
AGE	18–34	41.4%	58.6%	$X^2 = 3.54$; df = 2; $p = 0.170$
	35–54	43.6%	56.4%	
	≥55	48.0%	52.0%	
POPULATION	Less than 10,000 inhabitants	48.7%	51.3%	$X^2 = 5.70$; df = 1; $p = 0.017$
	More than 10,000 inhabitants	42.4%	57.6%	
REGION	Northern Greece	43.9%	56.1%	$X^2 = 0.105$; df = 2; $p = 0.949$
	Central Greece	44.6%	55.4%	
	Southern Greece	43.7%	56.3%	
I USE PESTICIDES	No	30.2%	69.8%	$X^2 = 193$; df = 1; $p < 0.001$
	Yes	62.6%	37.4%	
PROFESSION	Civil servants	40.2%	59.8%	$X^2 = 40.4$; df = 6; $p < 0.001$
	Farmers	63.3%	36.7%	
	Private employees	43.3%	56.7%	
	Retired	55.0%	45.0%	
	Self-employed	54.9%	45.1%	
	Unemployed	32.4%	67.6%	
	University students	39.1%	60.9%	
EDUCATION	Secondary education	41.4%	58.6%	$X^2 = 1.57$; df = 1; $p = 0.211$
	Higher education	44.8%	55.2%	

4. Discussion

This study investigated the attitudes and perceptions of Greek consumers in respect to the balance between the benefits and risks of pesticide use. According to our knowledge, no previous study has attempted to elucidate the consumers' views on pesticide use in Greece and, moreover, this is the first large-sample survey conducted regarding the Greek consumers' attitudes towards this issue. The subjects used in this survey came from all Greek Regions, were residents of urban and rural areas, and belonged equally to both genders. All age groups were adequately represented, ranging from 18 to over 65 years old. On a central tendency basis, participants were regular agricultural food consumers, frequently consuming fruits and vegetables, following the traditional Greek cuisine. They occasionally consumed certified agricultural food products and rarely consumed organically or self-produced fruits and vegetables.

Data analysis, using the median of participants' responses as the central tendency measure, revealed neither disagreement, nor agreement to the statement under consideration, i.e., whether or not the benefits of using pesticides outweigh the potential risks. Nevertheless, a significantly higher proportion of unfavorable responses were found. Approximately 55% of the respondents to the survey of the present study seem not to be supportive of a statement implying the predominance of benefits over the potential risks from the pesticide use. This outcome was expected once the findings of the previous Special Eurobarometer survey, concerning the food safety in the EU, were taken into account. Greek consumers ranked pesticide residues as the most important food safety concern, followed by animal diseases and veterinary pharmaceutical residues in the meat [41].

In the overall regression model, the general hypothesis that perceptions, personal concerns, and views about several procedures and sociodemographic characteristics help to explain consumers' attitudes on pesticide use was confirmed. According to the results, there is evidence that the participants supported the statement that "there are more benefits of pesticide use than their potential risks" if they were in favor of the beneficial contributions of pesticide use and they were professional or amateur users of pesticides. A similarly

positive response was recorded if the participants were males and expressed more intense confidence in plant food safety and control procedures, were informed about pesticides by specialized or general information sources, and, finally, showed confidence in plant food certification procedures. Perceived threats about pesticide use was a significant predictor that negatively influenced the respondents' attitude regarding the pesticides' benefits versus their potential threats ratio.

The stronger positive predictor of the consumer's attitude towards pesticides seem to be the perceived pesticide contributions. They can be analyzed into the constituent variables of pesticides' contribution to the national income, their necessity to ensure crop production and food security, and the belief that the user and the consumer can be safeguarded through the proper application of pesticides. In central tendency terms, respondents in the survey agreed with all the above elements. Perceived pesticide contributions seem to influence the judgments of participants in favor of the statement that pesticide benefits outweigh their potential threats. Our results are in line with Dunlap & Beus (1992) [71], who have reported that the perception of the necessity of pesticide use was the most important predictor of public views on pesticides. Attempts to explain such outcomes have been made through the concepts of cognitive consistency. People are possessed by a strong desire for consistency in their beliefs. This is about the consistency between a comparatively stable affective or evaluative orientation toward an issue and the individual's views about how this relates to other issues of affective significance. Issues that are favored are usually considered to serve the value background, to have characteristics that are favorable, grouped with other attractive topics, and stand out from the unattractive ones [72]. Previous studies have shown the existence of a strong inverse interdependence between risk and benefit judgments. Alhakami & Slovic (1994) [73] have shown that issues towards which people had positive attitudes were viewed as having high benefit and low risks and vice versa. Ueland et al. (2012) [44] stated that if there is a greater benefit associated with a product, more risk can be accepted. Accordingly, Dunlap and Beus (1992) [71] have found that those who considered pesticides essential did not perceive a high risk, suggesting that they were more likely to consider the use of pesticides acceptable. In our results, this negative relationship that has been previously described between perceived risks and benefits is clearly indicated in the PCA graph, where the perceived threats point in the opposite direction than the perceived pesticide contributions.

The status of a pesticide user, whether for professional or amateur reasons, particularly affects the participants' positions and views on pesticides. While most of the participants were not users of pesticides (57.3%), neither for professional nor amateur reasons, this is the strongest positive predictor variable after the perceived pesticide contributions. This result confirms Coppin et al. (2002) [74] who also found that the pesticide-use variable was a significant predictor of acceptability of pesticide use. This could be explained by Huang (1993) [75] who reported that personal use of pesticides has a significant impact in reducing consumers' fear about pesticide residues on food and the balance between the benefits and risks associated with them. It seems that familiarity with an issue reduces the feelings of uncertainty and increases perceived control, which lays the basis for the consumer to be more appreciative of the beneficial aspects of the issue [44,75]. It should be noted that no significant influence was recorded from the population of the place of residence variable (i.e., urban/rural areas). Pesticide users acting as professional or amateur farmers may have also experienced the importance of pesticide use in successful crop production directly associated with food security at a community level. This is in line with Coppin et al. (2002) [74], who stated that for pesticide perceptions, personal experience is more important than residence status.

Male gender also has a significant impact on consumer views, causing a positive effect on the acceptance of pesticide use benefits against their potential negative effects. The finding of a positive and significant male gender effect is consistent with previous studies that have shown that females have a higher risk perception than males with respect to chemical residues [51,54,71,75,76].

Perceived plant food safety and confidence in pesticide residues control procedures positively affects the respondents' attitude. This outcome is related to the constituent perceptions that food of plant origin is generally safe, and that plant food produced in Greece is as safe as in other EU States. Respondents agreed to both aforementioned statements. Two additional variables were associated with the above predictor, namely, that the consumer is generally not at risk from the consumption of fruit and vegetables and that plant food is routinely tested for pesticides residues. These results depict the importance of control procedures and effective implementation of pesticide and food safety regulations. At the central tendency level, neutrality was recorded to both statements among participants. The results of previous Special Eurobarometer survey have shown that a 28% of Greek consumers agree that official Authorities and EU keep them safe from food risks, just below the EU28 average [41]. This implies the need for further involvement of food safety Authorities in the communication of the risk associated to pesticide use to the Greek public. Given the inherent difficulty of such an endeavor due to difference in risk perception between experts and lay people [44,77], the challenging and decisive role that official bodies are called upon to play is realized.

Our results depicted that information plays an important role in consumer's perceived views on pesticide use. Being informed about pesticides by either specialized or general information sources is a significant predictor of the participants' positive predisposition to the benefits of pesticide use over any potential adverse effects. Among specialized information sources, agronomists seem to be the most frequent source for obtaining information on pesticides. This outcome is explained by the fact that in Greece, the legislation on pesticides requires that certain conditions of scientific background are met, so a natural or legal person is allowed to be actively involved in the trade of pesticides [78]. Nonetheless, information sources on pesticides such as official websites, public bodies, newsletters, and scientific journals were more strongly associated with the principal component of specialized information sources in the PCA. General information sources (i.e., electronic press, television-radio, press and social media) were also positive predictors of the consumer's views on pesticides. In central tendency terms, respondents declared that they occasionally chose electronic press as a source of information on pesticides, while they rarely used television-radio, press, or social media.

Huang (1993) [75] has stated that consumers have the tendency to reverse the accepted hierarchy of risks from food, perhaps due to misinformation or lack of knowledge. Koch et al. (2017) [50] reported that unawareness of legal maximum residue limits was associated with increased levels of concern about pesticide residues in food. Our results depicted the key role of information related to pesticide use, particularly from specialized sources, communicating either risk assessment or the strict regulatory framework governing the trade and use of pesticides. More specifically, after participants' clustering, a significantly lower frequency of being informed about pesticides has been found among non-supporters than supporters of pesticide use benefits versus threats. This could imply a limited level of knowledge about pesticides, with possible implications to consumer's perceived threats, in line with Webster et al. (2010) [79], who reported that the public often ranks higher a food safety issue based on a lack of available knowledge.

An interesting principal component that has emerged from the results of the present study, with positive predictive influence on consumer's perceptions on pesticides, is the confidence in plant food certification procedures. This trust stems from the importance of traceability for consumers and information provision by plant-food labeling, along with the sense of safety that certification promotes, especially of integrated farming management certified products. Participants generally agreed to all above variables. The results are supportive of previous research showing the importance that certification, information provision, and labeling play to Greek consumers in order to assess the quality of food they buy [54–58,60–62]. Ueland et al. (2012) [44] commented that the lack of consumers' own control can be substituted by control exercised of trusted bodies. Benefits are more

easily perceived when products come from trusted sources or with messages from trusted sources.

Perceived risk is the primary determiner of the risk adjustment ratings [80]. The participants' perceived threats of pesticide use negatively influence their views and perceptions on pesticide benefits over their potential risks, which is in accordance with Huang's (1993) [75] findings. Perceived threats are associated with the concern that their health has been affected, feeling insecure for the health of their loved ones, and expression of worries for their health from the pesticide residues. Participants particularly agreed with the two last statements. This outcome implies that pesticide residues in food is an issue of concern for Greek consumers, linked directly to their health. This is in line with the previous Special Eurobarometer survey reports [41]. It has been shown that individuals perceive greater control over biological food risks than chemical/technical risks [34]. Attempts to explain the high ranking of risk perceptions of pesticide residues have been made by Dickson-Spillmann et al. (2011) [76], who reported that consumers are dose–response insensitive, which, in turn, lead to higher risk perceptions of contaminants. This aspect has been also linked by Koch et al. (2017) [50] to the lack of knowledge of the regulatory framework and the presence of legal limits of residues in food, while in the same line, the presence of a discrepancy between expert and lay views of chemical risks has been reported [81]. This may explain the negative relationship that occurs in the PCA graph between perceived threats and consumers' confidence in plant food safety and food certification procedures.

The Southern Greek geographic region seems to be a significant negative predictor of respondents' views on pesticide benefits over their potential risks. This outcome should be expected due to higher perceived threats that participants of Southern Greek origin have expressed, compared to respondents from Central and Northern Greece. This result might be explained according to the findings of Hohl & Gaskell (2008) [31], who reported that food risk perception is strongly associated with generalized risk sensitivity. Additionally, the fact that environmental groups and the media often play a watchdog role as Meagher (2019) [34] states, may help explain this association with heightened concerns; research is needed to confirm this hypothesis.

The influence of a special plant-food consuming habit of the participants, which was associated with consumption of fruits and vegetables, following the traditional Greek cuisine, consumption of organically produced and of certified origin (PDA, PGI) agricultural products was not of significance concerning participants' views on pesticides. This may be attributed to the fact that there were no significant differences found in special plant-food consuming habit between the two distinct clusters of participants. In a similar way, several other socioeconomic variables were not found to influence the respondents' views on pesticides, such as education level, urban or rural areas of residence, the presence of minor children in the family, the availability of leisure time, smoking, vegetarian habits, physical activities, and profession.

Two distinct consumer groups were identified regarding participants' perceptions on pesticide benefits versus their potential risks. In the first group, supporters of pesticide benefits over their potential threats have been classified. Consumers who fit this profile received information mainly from specialized and general sources of information, are in favor of pesticide use contributions, express confidence in plant-food safety and controlling procedures, are primarily males, farmers, self-employed persons, retired, and pesticide users. In the second group, non-supporters of the pesticide use benefits over the risks statement have been categorized. Consumers in this category get less frequently informed about pesticides, express lower confidence in plant-food safety, declare more intense perceived threats, are primarily females, mostly inhabitants of urban areas, largely are not users of pesticides, civil servants, private employees, unemployed persons, and university students.

Several limitations should be taken into account concerning our study. First, our results were obtained through web survey disseminated by email, Messenger, and Viber applications, hence, anyone unfamiliar with communication technology was inevitably

excluded. These individuals might have a low educational level or belong to older age groups. Second, the data were collected from self-reporting opinions with no means of checking their veracity. Third, the sample was collected from all over Greece, however, it may not be representative in several aspects of the Greek population (i.e., education, occupation, age group >65 years etc.). Fourth, although information sources were investigated, the study did not address other possible sources of information on pesticides like friends and family, peers, other internet content, bloggers, influencers, participation in collectives, consumer associations, activist organizations, etc., which constitute a proposal that future studies should further explore these issues.

5. Conclusions

Overall, this study represents a first attempt to identify the main predictors influencing Greek consumers' attitude concerning the balance between the benefits and risks of pesticide use. It was found that Greek consumers express high concerns about pesticide residues in food for their loved ones and their own health. At the same time, however, they recognize to a significant extent the beneficial contributions of the use of pesticides for food security and the national economy as well. The PCA analysis has identified several significant predictors of consumer's attitude towards benefit—risks perception of pesticide use, personal values, user status, gender, confidence in controlling and certification procedures, and received information. Knowing the perception of the public regarding the pesticide-use risks in food is essential to design clear and transparent risk communication strategies, which should consider, in addition to scientific information, the subjective aspects that affect risk perception. Our results suggest several implications concerning the undertaking of initiatives by competent authorities in the organization of general public training programs on food safety risks literacy to facilitate a better understanding of the information received by the public and reassure consumers on the safety of the plant-food supplying chain from farm to fork. Our results demonstrate that efforts for risk communication should be structured to address food safety issues, pesticide regulation, and residue control procedures targeting the general public via particularly general information sources, aiming at a broader audience. For such a purpose, the cultivation of a stronger connection between journalists and scientists, as well as more active involvement of official bodies are necessary to avoid the unfair provocation of dread and anxiety in the public. In addition, greater visibility to the wider public via specialized and general information sources of the work of the food safety authorities is considered equally important. Furthermore, it is suggested that there is a need more active involvement in the communication of the certification and traceability benefits of plant food to be taken over by stakeholders, especially the farmers' associations, should they gain consumers' confidence.

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Appendix A

Table A1. Sociodemographic characteristics of the respondents (N = 1846).

Demographic Variables		Frequency	Percentage
Gender	Female	896	48.5%
	Male	950	51.5%
Age	18–24	220	11.9%
	25–34	195	10.6%
	35–44	404	21.9%
	45–54	669	36.2%
	55–64	304	16.5%
	≥65	54	2.9%
Education level	Less than high school	31	1.7%
	High school–Technical education	397	21.5%
	Bachelor's degree	727	39.4%
	Master's degree	565	30.6%
	Doctoral degree	126	6.8%
Geographic area	Northern Greece	540	29.3%
	Central Greece	473	26.6%
	Southern Greece	833	45.1%
Population of place of residence	Less than 10,000 inhabitants	468	25.4%
	More than 10,000 inhabitants	1378	74.6%
Minor children in the family	No	1027	55.6%
	Yes	819	44.4%
Ample leisure time	No	735	39.8%
	Yes	1111	60.2%
Smoking	No	1404	76.1%
	Yes	442	23.9%
Vegetarians by conviction	No	1722	93.3%
	Yes	124	6.7%
Physical activities	Never	243	13.2%
	Occasionally	1207	65.4%
	Systematically	396	21.4%
Pesticides users either professional or amateur	No	1058	57.3%
	Yes	788	42.7%
Profession	Civil servants	814	44.1%
	Private employees	344	18.6%
	Self-employed	224	12.1%
	Farmers	98	5.3%
	Unemployed	71	3.9%
	University students	215	11.7%
	Retired	80	4.3%

Table A2. Results of the principal component analysis.

Original Variables (5-Point Likert Scale Statements)	Median [1]	IQR [2]	Principal Components							Uniqueness [3]
			SINF	CONTR	GINF	SAFE	CERT	THR	CONS	
			Specialized Information Sources	Perceived Pesticides' Contributions	General Information Sources	Confidence in Plant Food Safety	Confidence in Food Certification Procedures	Perceived Pesticides' Threats	Special Plant Food Consumer Habits	
I get informed about pesticides by Official Websites	3	2	0.910							0.188
Public Bodies Newsletters	3	2	0.861							0.261
Scientific Journals	3	2	0.852							0.269
Agronomist	4	3	0.709							0.431
Pesticides contribute to the increase in national income	4	1		0.805						0.410
Pesticides contribute to increased food production	4	1		0.788						0.441
The use of pesticides is inevitable	4	2		0.700						0.476
Pesticides's proper application secures the user	4	2		0.695						0.424
Pesticides's proper application secures the consumer	4	2		0.649						0.413
I get informed about pesticides by Electronic Press	3	2			0.789					0.287
Television-Radio	2	2			0.788					0.356
Press	2	2			0.741					0.375
Social Media	2	2			0.724					0.474
Food of plant origin is generally safe	4	2				0.787				0.432
Plant food produced in Greece is as safe as other EU States	4	1				0.750				0.445
The consumer is generally not at risk from the consumption of fruit and vegetables	3	2				0.750				0.351
Food of plant origin is tested for pesticides residues	3	2				0.663				0.450
The existence of labeling (traceability) reassures me	4	1					0.856			0.276
Certified products are safe	4	1					0.838			0.303
Integrated farming management products are safe	4	1					0.805			0.316
I think my health has been affected	3	1						0.810		0.289
I feel insecure about the health of my own people	4	2						0.783		0.427
I'm worried about my safety from pesticides residues in food	5	1						0.782		0.345
I consume fruits and vegetables	4	1							0.775	0.408
I follow the traditional Greek (Mediterranean) cuisine	4	1							0.768	0.433
I consume products of certified origin (PDO, PGI)	3	2							0.604	0.563
I consume organic fruits and vegetables	2	1							0.572	0.511
Sum of the squared loadings			5.064	3,072	2,278	1,937	1,683	1,512	1,101	
Scale reliability (McDonald's ω)			0.865	0.799	0.777	0.795	0.747	0.720	0.634	
Explained variance %			18.757	11.377	8.438	7.175	6.232	5.598	4.078	
Cumulative variance %			18.757	30.134	38.572	45.747	51.980	57.578	61.656	
Bartlett's Test of Sphericity	X^2 = 16,358; df = 351; $p < 0.001$									
KMO Measure of Sampling Adequacy test	0.829									

[1]: Median values of the distribution of participants' replies to the 5-point Likert scale questions (1 = never to 5 = habitually, or 1 = totally disagree to 5 = totally agree, whatever applicable). [2]: Interquartile range. [3]: Proportion of variance that is "unique" to the variable and not explained by the PC's. Uniqueness is equal to 1—Communality. The lower the Uniqueness the greater the relevance of the variable in the PC model. *Note*: "promax" rotation was used, variable loadings > 0.6 and Uniqueness < 0.6 were selected.

Table A3. Results of binomial logistic regression analysis.

Model Coefficients—Dependent Statement: ***The Benefits of Pesticide Use Outweigh Their Potential Risks***									
		95% Confidence Interval		**Wald Test**				**95% Confidence Interval**	
Predictor	**Estimate, b**	**Lower**	**Upper**	**SE**	**Z**	***p***	**Odds ratio**	**Lower**	**Upper**
Intercept	−0.669	−0.920	−0.418	0.128	−5.222	<0.001	0.512	0.399	0.658
SINF—"*Specialized information sources*"	0.176	0.038	0.313	0.070	2.502	0.012	1.192	1.039	1.368
CONTR—"*Perceived pesticides' contributions*"	1.343	1.166	1.520	0.090	14.873	<0.001	3.829	3.208	4.570
GINF—"*General information sources on pesticides*"	0.156	0.034	0.279	0.062	2.502	0.012	1.169	1.034	1.321
SAFE—"*Confidence in plant food safety*"	0.339	0.200	0.478	0.071	4.772	<0.001	1.404	1.221	1.613
CERT—"*Confidence in plant food certification procedures*"	0.143	0.008	0.277	0.069	2.074	0.038	1.153	1.008	1.320
THR—"*Perceived pesticides' threats*"	−0.286	−0.418	−0.153	0.067	−4.232	<0.001	0.752	0.658	0.858
CONS—"*Special plant food consumption habits*"	−0.002	−0.127	0.122	0.063	−0.039	0.969	0.998	0.881	1.130
Users of pesticides	0.534	0.259	0.809	0.140	3.803	<0.001	1.706	1.295	2.246
Male gender	0.397	0.148	0.646	0.127	3.125	0.002	1.488	1.160	1.908
Southern Greece geographic region	−0.302	−0.590	−0.015	0.147	−2.060	0.039	0.739	0.555	0.985
Predictive measures: AUC = 0.855; Sensitivity = 0.747; Specificity = 0.813									

Note: Estimates represent the log odds of "The benefits of pesticide use are more than their potential risks = 1" vs. "The benefits of pesticide use are more than their potential risks = 0".

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