agriculture

Article

Environmental Knowledge, Values, and Responsibilities Help to Enhance Organic Farming Intentions: A Case Study of Yunlin County, Taiwan

Po-Ching Wang [1,*], Fang-Chun Liu [2], De-Chih Lee [3] and Ming-Ying Lin [4]

1 Department of Landscape Architecture and Agricultural Extension Center, National Chiayi University, Chiayi City 600355, Taiwan
2 Mustard Seed Creative & Design INC., Taichung 403010, Taiwan; fachliu07@gmail.com
3 Department of Information Management, Da-Yeh University, Changhua City 515006, Taiwan; dclee@mail.dyu.edu.tw
4 Department of Plant Medicine and Agricultural Extension Center, National Chiayi University, Chiayi City 600355, Taiwan; mylin@mail.ncyu.edu.tw
* Correspondence: gaiascape@hotmail.com or pcwang@mail.ncyu.edu.tw; Tel.: +886-920-037-606

Abstract: This study aimed to identify the key factors that may influence farmers' support for organic farming, which is an eco-friendly approach that nourishes the productivity of agricultural and ecological systems. To explore farmers' adoption of organic-agriculture-related behaviors and the factors that influence these behavioral intentions, this research developed a questionnaire based on Kaiser's theory of ecological behavior. The participants were 152 farmers, who were recruited via stratified sampling from four major agricultural zones in the county. The results revealed that environmental knowledge, environmental value, and feelings of responsibility positively influenced farmers' behavioral intentions toward organic agriculture. The positive influence of environmental knowledge on behavioral intentions was enhanced by farmers' experience, age, and time spent in agriculture each week. However, the positive influences of environmental value and feelings of responsibility were not moderated by the three aforementioned variables. Appropriate promotional and educational measures should incorporate the real-life experiences of farmers to increase their environmental knowledge, environmental value, and feelings of responsibility toward organic agriculture, thereby effectively enhancing their willingness to adopt this type of agriculture.

Keywords: organic agriculture; behavioral intention; environmental knowledge; environmental values; environmental responsibility

check for updates

Citation: Wang, P.-C.; Liu, F.-C.; Lee, D.-C.; Lin, M.-Y. Environmental Knowledge, Values, and Responsibilities Help to Enhance Organic Farming Intentions: A Case Study of Yunlin County, Taiwan. *Agriculture* **2023**, *13*, 1476. https://doi.org/10.3390/agriculture13081476

Academic Editor: Nathalie Iofrida

Received: 16 March 2023
Revised: 25 June 2023
Accepted: 12 July 2023
Published: 26 July 2023

1. Introduction

In terms of agricultural resources, most of the arable land in Taiwan is distributed across the central and southern plains found along the western coast. These regions are collectively known as the "rice bowl". The preliminary statistics of a 2020 agriculture, fishery, and animal husbandry census showed that the aforementioned regions account for 78.15% of the total arable land in Taiwan (411,600 ha out of 526,700 ha) [1]. However, given the current state of Taiwan's promotion of organic agriculture, the size of farmland where agricultural productions are accomplished without the use of chemical fertilizers and synthetic pesticides grew by only 27,400 ha in the past 10 years, totaling 97,000 ha in 2020, or 18.4% of the total cropland area (526,700 ha). To strengthen and promote eco-friendly and sustainable agricultural practices, in 2018, Taiwan promulgated the Organic Agriculture Promotion Act, which integrates the management of existing organic products, accreditations, and testing institutes. The goal of this act is to strengthen the promotion of organic agriculture and assist and guide farmers in undergoing industry adaptation and transformation. Currently, organic agriculture is centered on eco-friendly environmental values. More and more farmers are adopting environmentally friendly and sustainable farming practices to contribute to agricultural sustainability. Yunlin County, one of Taiwan's rice bowls, was chosen to be the site of this study for these reasons.

In view of Taiwan's aging society, the agricultural industry is likely to face difficulties due to aging agricultural participants and a decline in the size of the workforce. Most agricultural households in Taiwan have a small agricultural production size. The mean age of agricultural farmers in Taiwan was 64.13 years, an increase of 3.24 years in the last ten years. Factors such as career transition from agriculture, declining birth rates, and rural flight have resulted in a reduction of 18,500 (2.37%) agricultural households over the past several decades. Additionally, the total household size in 2020 decreased by 46,400 persons (16.7%). This study included both part-time and full-time agricultural workers as research objects as part of its effort to conform to the profile of Taiwan's agricultural labor force.

The goal of this study was to explore the behavioral intentions and relevant factors that influence farmers' adoption of organic agriculture and provide a reference for organic agriculture promotion and implementation based on its results.

1.1. The Significance of Organic Agriculture for Environmental Sustainability

Organic agriculture originated in response to the negative environmental impacts of industrial fertilizers and industrial agriculture, which focus on higher output. The concept of organic farming can be traced back to a series of lectures on organic crop growing presented by Dr. Rudolf Steiner in 1924. The term and concept of organic farming were formally introduced in 1940 by Lord Northbourne and have since been widely adopted across the globe [2,3].

Organic agriculture emphasizes the value of agricultural environments and ecologies; it implements systematic agriculture management practices in accordance with the farmland conditions. As a comprehensive production and management system, organic agriculture applies various nonchemical approaches to tackle soil fertility, pests, and weeds, with the ultimate goal of maintaining the biodiversity of farmland and ensuring agricultural sustainability. The Food and Agriculture Organization (1999) [4] describes organic agriculture as a holistic production management system that promotes and enhances the health of agroecosystems, including biodiversity, biological cycles, and soil biological activity. It stresses the use of management measures based on agronomic, ecological, and mechanical methods (whenever possible) instead of synthetic materials, while also employing locally adapted systems based on regional conditions to realize specific functions within the system. Organic agriculture is defined in Taiwan's Organic Agriculture Promotion Act as "any farming practice, including cultivation, forestry, aquaculture, and animal husbandry, which does not use chemical fertilizers, chemical pesticides, genetically modified organisms, and related products, based on the principle of ecological balance and nutrient recycling". Wang (2018) [5] stressed that production techniques in organic agriculture should focus on cultivating healthy soils, the appropriate use of various organic materials and agricultural technologies, and rational fertilization in accordance with soil testing results. The next step is to implement and maintain an ecologically diverse crop rotation system to create a complex yet balanced ecological environment. This is followed by applying holistic pest and weed management practices that exclude chemical fertilizer use to safeguard the quality of organic agricultural products.

Organic agriculture positively affects the environment and resource utilization and is recognized as a solution to mitigate agriculture's environmental problems. It has gradually gained popularity in modern agricultural development. The increasing frequency and intensity of extreme climate events induced by climate change have recently become a major challenge for agricultural production and food security. Lack of precipitation and major flooding significantly threaten the supply and accessibility of water resources for agriculture. Greenhouse gas emissions from nitrogen fertilizers and livestock manure exacerbate climate change [6]. Many studies have pointed out that organic agriculture outperforms industrial agriculture in numerous environmental indicators, such as soil health, biodiversity, and greenhouse gas emissions [7,8]. Measures such as improving farmland management practices, adopting organic production, and increasing fertilization efficiency not only alleviate farmland degradation, but also strengthen agricultural resilience and achieve sustainability in response to extreme climate change.

1.2. The Factors Influencing Farmers' Adoption of Eco-Friendly Behaviors

Environmental behaviors broadly refer to environmental-related and eco-friendly behaviors. Peyton and Hungerford (1977) [9] classified six types of environmental behaviors: persuasion, consumerism, political action, legal action, eco-management, and interaction. The topic of environmental behaviors has been widely discussed in academia, and researchers have identified a multitude of factors and variables that influence such behaviors. Stern (2000) [10] proposed four types of causal variables that influence personal–contextual or organism–environment behaviors: attitudinal factors, contextual factors, personal capabilities, and habit and routine. Hungerford and Volk (1990) [11] categorized three types of variables that may influence environmental behaviors and suggested that a certain level of synergism may exist between these variables: (1) entry-level variables, which are good predictors of behavior and which are necessary for or empower one's decision making; (2) ownership variables, thanks to which environmental issues become personal; and (3) empowerment variables, which enable people to believe that they can make changes and resolve important problems. Empowerment variables are salient to creating environmentally responsible citizens. Based on the qualities of eco-friendliness and their positive influence on the environment, behaviors toward adopting organic agriculture should fall within the scope of pro-environmental behaviors and eco-management.

According to the literature, environmental, ecological, and economic factors are important determinants of farmers' adoption of organic agriculture [12–14]. Among the factors that farmers consider when engaging in organic agriculture is the short-term cost–benefit analysis of product quantity or investments and income. This includes farmers' skepticism of the feasibility of organic agriculture, the influence of high efficacy and productivity on the socioeconomic sustainability of an agricultural enterprise, the scale of the enterprise, and economic performance in terms of revenue. Other considerations include long-term sustainability issues, such as the biodiversity, energy efficiency, and greenhouse gas emissions of a farmland plot [7,15]. Indeed, farmers' adoption of organic-agriculture-related behaviors encompasses a wide range of socioeconomic, environmental, and cost–benefit-related factors. However, studies of farmers' behaviors should not only center on short-term personal investments in agriculture; they must also include the influence of moral factors on behavioral decision making, such as long-term concern for environmental sustainability.

Several behavioral models have been created to predict various environmental behaviors. Many of these models have been widely applied in relevant fields after being empirically proven. These models include the value–belief–norm theory (VBN) [10,16], the model of responsible environmental behavior (MREB) [17], the theory of reasoned action (TRA) [18], and the theory of planned behavior (TPB) [19]. In particular, the ecological behavior measurement model developed by Kaiser, Ranney, Hartig, and Bowler (1999) [20] is a simplified TRA model, in which the basic structure is formed by replacing subjective norms and attitudes with the similar composite concepts of values and knowledge. The predictive performance of the rational choice theory can be enhanced by expanding one's feelings of responsibility (FR) toward the environment to the field of morality. In this sense, environmental knowledge (EK), environmental value (EV), and FR predict ecological behavioral intentions (BI) and, thus, ecological behaviors.

After consolidating the literature on environmental behavior theory, we arrive at the following points: (1) behavioral intention is a good predictor of environmental behavior [17,18]; (2) since environmental issues involve a conflict between personal interests and the interests of others, ethical norms are key factors that influence one's tendency to adopt environmental behaviors [10,21]; (3) prior to developing behavioral intentions toward and taking practical action to resolve environmental issues, one must first acknowledge the existence of these issues and be knowledgeable about the relevant solutions—knowledge is thus a prerequisite for adopting environmental behaviors [17]; (4) one's tendency to adopt environmental behaviors arises from personal values and perspectives, which means that paying attention to one's values is important for verifying one's support for environmental behaviors [16]; and, (5) in the case of actions with higher behavioral costs, situational factors and personal capabilities may influence the prediction of environmental behavior [16,17].

1.3. Measuring Farmers' Behavioral Intentions toward Organic Agriculture

Values, knowledge, ethics, and BI can be important predictors of environmental behaviors. In this study, ethics is represented by feelings of responsibility. We used Kaiser et al.'s (1999) [20] model of ecological behavior as our research framework, as shown in Figure 1, and propose that behavioral intention is influenced by EK, EV, and FR.

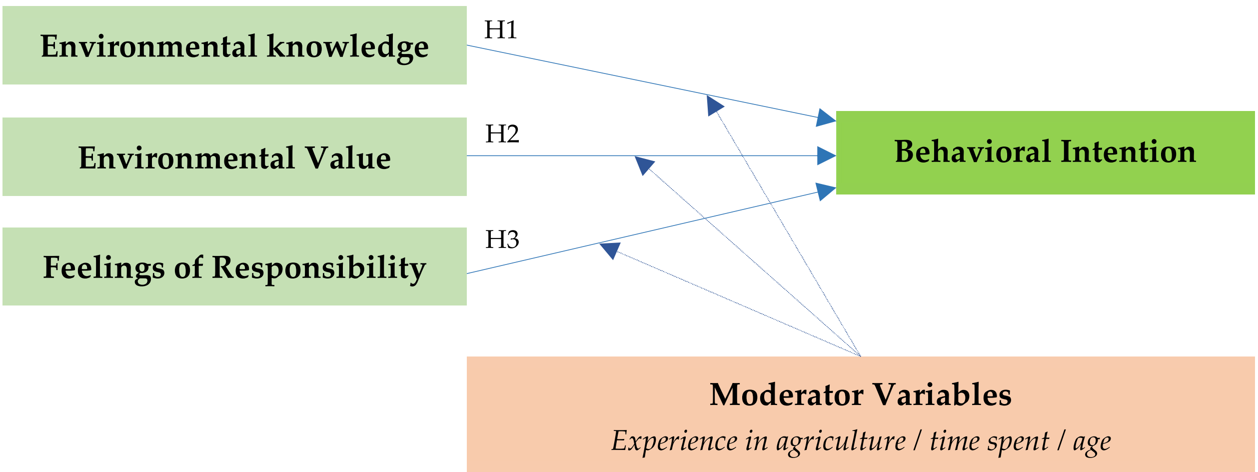

Figure 1. The research framework.

Behavioral intention (BI) is a person's propensity to perform a specific behavior, as well as their positive or negative behavioral tendency or notion toward an attitude. Influenced by intrinsic and extrinsic environmental factors, BI is determined by one's personal attitudinal preferences and serves as a quantitative measure of one's likelihood to adopt a specific behavior [18]. Cronin, Brady, and Hult (2000) [22] explained that positive behavioral intentions entail several dimensions, such as (1) describing the positive performance of a product/service to customers, (2) recommending it to other customers, (3) maintaining loyalty (repurchase intentions), (4) being willing to pay more to a service provider, and (5) paying higher prices. The present study employed BI as a variable for measuring farmers' tendency to adopt organic-agriculture-related behaviors.

Environmental knowledge (EK) is one's knowledge about the environment and associated issues [11]. According to Lam (2014) [23], EK covers the following three aspects: (1) factual knowledge, which is knowledge of the factors and outcomes of environmental issues as well as environmental terminology; (2) action knowledge, also known as action- and strategy-related knowledge or eco-behavior knowledge (knowledge of the behavior itself as well as the methods for performing the behavior), entails action options, such as the knowledge of the means for adopting pro-environmental actions [24]; and (3) effectiveness knowledge, which is the understanding of the effectiveness of a particular environmental action, including its costs and benefits compared to other behaviors. Most researchers agree that environmental knowledge indirectly influences environmental behaviors, that is, BI or other variables moderate the relationship between EK and behavior [20,23]. On this basis, this study defines EK as farmers' knowledge of adopting organic-agriculture-related behaviors and its relevant issues. Therefore, we propose hypothesis H1 as follows: farmers' EK is positively correlated with their behavioral intentions to adopt organic agriculture.

Environmental value (EV) refers to a person's perceived value of the environment and related issues. EV is similar to subjective social norms and is associated with EBI [23]. Stern and Dietz (1994) [25] proposed three types of environment value orientations: (1) egoistic values, where one cares about the environment solely because environmental damage negatively impacts one's personal benefits; (2) social-altruistic values, or human-centered values, where one cares about the environment for the sake of the collective good or of the goals of humanity [26]; and (3) biospheric values, which are intrinsic values that reflect one's care for the natural environment in general. This study defines the variable of EV as farmers' perceived value in adopting organic-agriculture-related behaviors and relevant issues. We thus propose hypothesis H2 as follows: farmers' EV is positively correlated with their behavioral intentions to adopt organic agriculture.

Feelings of responsibility (FR) are one's responsibility to complete tasks or, in other words, the readiness to shoulder the tasks and missions one is responsible for. BI can be predicted more accurately through the personal moral obligation of FR [20]. According to Hellison and Wright (2011) [27], there are five phases for the establishment and development of FR: respect for the rights and feelings of others, effort and co-operation, self-direction, helping others and leadership, and transfer. Developing FR through the integration of knowledge and skills with values and then applying it to different aspects of life enable a person to exhibit responsible behaviors. Therefore, this study defines FR as farmers' willingness to shoulder the responsibility of adopting organic-agriculture-related behaviors. Therefore, we propose hypothesis H3 as follows: farmers' FR is positively correlated with their behavioral intentions to adopt organic agriculture.

In addition to BI being mainly influenced by EK, EV, and FR, this study also suggests that farmers' experience in agriculture, age, and time spent per week in agriculture moderate the influences of these three variables on BI. Many studies agree that age and experience moderate the BI influence, such as the Unified Theory of Acceptance and Use of Technology (UTAUT) and Technology Acceptance Model 3 (TAM 3) [28–32]. Therefore, this study proposes hypothesis H4 as follows: farmers' age, experience in agriculture, and time spent per week in agriculture mediate the influences of EK, EV, and FR on BI.

2. Materials and Methods

2.1. Instruments

To examine the influences of EK, EV, FR, and BI on farmers' intention to adopt organic agriculture, this study developed a structural questionnaire for data collection. The questionnaire was based on Kaiser et al.'s (1999) [20] model of ecological behavior, which was revised by integrating and referencing the local agricultural environment of Yunlin County. The questionnaire covered the participants' basic information and agricultural background. There were six items on EV, seven on EK, six on FR, and six on BI, all of which were measured on a seven-point Likert scale of agreement (1 = strongly disagree; 2 = disagree; 3 = somewhat disagree; 4 = neutral; 5 = somewhat agree; 6 = agree; 7 = strongly agree).

2.2. Research Locale and Participants

Yunlin County (23°42′18″ N 120°28′34″ E) is located in the central region on the western side of Taiwan (see Figure 2). Its topography mainly consists of flat plains, with an arable land size of 63,970 ha, which accounts for roughly 50% of the total land size of the county. Despite having the largest arable land size in Taiwan, only 357 ha of Yunlin's land has been certified as suitable for organic agriculture [1]. Yunlin's thriving agricultural sector has generated a wide variety and high output of agricultural produce. Its five major crops, in decreasing order, are rice, peanuts, corn, garlic, and bamboo shoots. Yunlin's agricultural regions can be divided into four major zones based on farmland environments and cultivated crops: the orchard zone (Douliu City, Gukeng Township, and Linnei Township), the rice zone (Dounan Township, Tuku Township, and two other administrative areas), the vegetable zone (Xilou Township and Erlun Township), and the grains and special crops zone (Huwei Township, Beigang Township, and five other administrative areas). The number of agricultural households in the four zones is 40,924, 48,318, 33,461, and 73,280, respectively, for a total of 195,983.

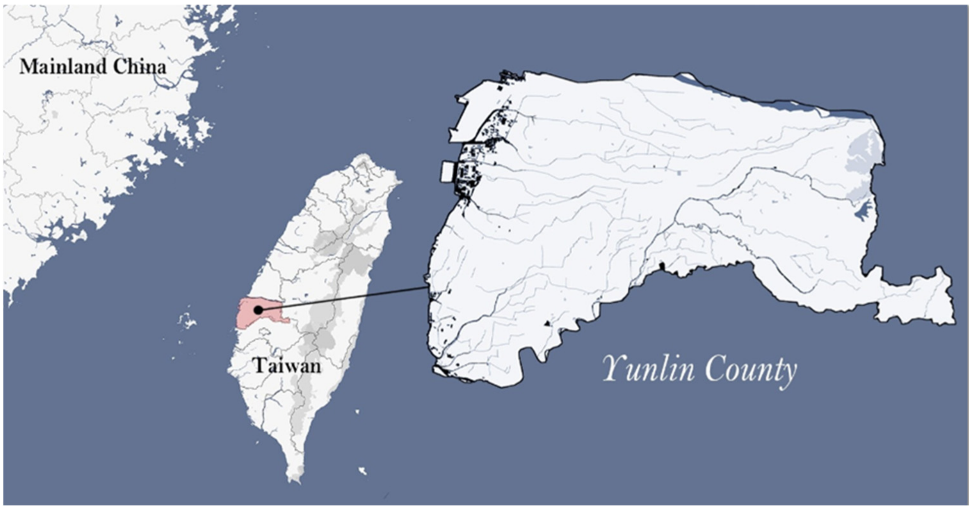

Figure 2. Research locale.

2.3. Sample Estimation and Sampling Method

The sample size was estimated according to the recommendations of Cohen (1988) [33] and Li (2002) [34]. The Type I error (α) was set at 0.05, the statistical power was 0.80, and the effect size was moderate. In order to minimize the possibility of Type I errors, we adopted conservative estimation methods. The regression analysis showed that the minimum sample size should be 84. Based on our estimate that the response rate might be only approximately 50%, we doubled this number and planned to recruit 168 participants through stratified sampling based on the stratified agricultural household and crop production zone data listed in a 2015 census of Yunlin's forestry, agricultural, fishery, and animal husbandry industries. A sampling ratio of 0.01% was used to recruit the participants from the orchard, rice, vegetable, and grains and special crops zones of arable land in Yunlin County.

2.4. Data Collection and Testing

The questionnaire was formally administered in July 2020 in Yunlin County, Taiwan. The questionnaire distribution was expected to be 168, however, 190 questionnaires were administered, with 152 valid responses and 38 invalid responses. To generate a basic overview of the sample, descriptive statistics analysis was performed using SPSS 20.0 software, followed by confirmatory factor analysis of the items with AMOS 24.0 software. Items with a factor loading lower than 0.5 were removed; this included three items concerning EK (the remaining four had a Cronbach's α of 0.823), two items concerning EV (the remaining four had a Cronbach's α of 0.783 and a χ^2/df of 9.330; associating items 1 and 5 yielded a Cronbach's α of 0.920 and a χ^2/df of 0.218), and no items concerning FR and BI (the six items of the two constructs had a Cronbach's α of 0.907 and 0.918, respectively). The data are presented in Table 1, which shows that the scale had good reliability and validity.

Table 1. Reliability and validity analysis.

Construct	Item	Factor Loading	Goodness of Fit	Reliability and Validity
Environmental value	EV1 EV3 EV4 EV5	0.790 0.619 0.739 0.883	$\chi^2/\mathrm{df} = 0.218$ GFI = 0.999 AGFI = 0.993 RMR = 0.007	Cronbach's α = 0.918 AVE = 0.583 CR = 0.846
Environmental knowledge	EK4 EK5 EK6 EK7	0.737 0.623 0.885 0.705	$\chi^2/\mathrm{df} = 2.622$ GFI = 0.982 AGFI = 0.911 RMR = 0.040	Cronbach's α = 0.823 AVE = 0.553 CR = 0.830
Feelings of responsibility	RF1 RF2 RF3 RF4 RF5 RF6	0.604 0.646 0.751 0.816 0.953 0.909	$\chi^2/\mathrm{df} = 4.819$ GFI = 0.931 AGFI = 0.794 RMR = 0.058	Cronbach's α = 0.920 AVE = 0.624 CR = 0.907
Behavioral intention	BI1 BI2 BI3 BI4 BI5 BI6	0.763 0.776 0.851 0.849 0.806 0.715	$\chi^2/\mathrm{df} = 4.699$ GFI = 0.934 AGFI = 0.803 RMR = 0.064	Cronbach's α = 0.918 AVE = 0.632 CR = 0.911

Note: sample size (N) = 152.

3. Results

3.1. Descriptive Statistics

In the sample (Table 2), 72.4% of the farmers were male and 27.6% were female (a male-to-female ratio of 2.6:1). Most (36.8%) of the farmers graduated from senior/vocational high school. A roughly equal proportion of them had agriculture as their main source of income, suggesting that one half of the sample supplemented their household income through other ventures. About half of the farmers (46.7%) had participated in organic consultancy but only 20.4% had participated in organic verification and 17.1% had received organic certification. This shows that the government should be more proactive in encouraging farmers to participate in organic agriculture.

Table 2. Descriptive statistics.

Variable	Category	Percentage
Sex	Male Female	72.4 27.6
Education level	Elementary school Junior high school Senior/Vocational high school University Graduate school and above	8.6 15.1 36.8 21.7 17.8
Agriculture as main source of income	Yes No	40.8 59.2
Has participated in organic verification	Yes No	20.4 79.6
Has received organic certification	Yes No	17.1 82.9
Has participated in organic consultancy	Yes No	46.7 53.3

Note: sample size (N) = 152.

3.2. Description of the Study Model

Table 3 shows the results of the simple linear regression analysis. The influences of environmental knowledge, environmental value, and feelings of responsibility on behavioral intention were all positive, with a standardized regression coefficient of 0.329, 0.473, and 0.665, respectively. All regression coefficients are statistically significant at 0.05 level, suggesting that hypotheses H1, H2, and H3 were supported. Among the three predictors of behavioral intention, feelings of responsibility had the highest contribution.

Table 3. Regression analysis.

Hypothesis	Standardized Regression Coefficient
H1: Environmental knowledge (EK) → Behavioral intention (BI)	0.329 ***
H2: Environmental value (EV) → Behavioral intention (BI)	0.473 ***
H3: Feelings of responsibility (FR) → Behavioral intention (BI)	0.665 ***

Note: *** indicates $p < 0.001$.

3.3. The Influence of Moderator Variables on the Study Model

To understand the range of influence of the moderation, the moderator variables were tested using the Johnson–Neyman technique. The results, as shown in Table 4 and Figure 3, suggested that experience in agriculture moderated the relationship between EK and BI, with the effect taking place when the Z-score of experience in agriculture exceeded −1.315. The positive influence of EK on BI increased with experience, meaning that farmers with more experience can enhance their organic-agriculture-related behaviors more effectively when they gain more EK. Age also moderated the relationship between EK and BI, with the effect taking place when the Z-score of age exceeded −1.388. Similar to the observation concerning experience in agriculture, the positive influence of EK on BI increased with age. Furthermore, the time spent per week on agriculture also moderated the relationship between EK and BI, with the effect taking place when the standard score of the time spent per week exceeded −0.909. The positive influence of EK on BI increased with the time spent per week on agriculture, meaning that enhancing the EK of farmers who spend more time on agriculture per week would effectively strengthen their behaviors toward organic agriculture. The influences of EV and FR on BI were not moderated by experience in agriculture, age, and time spent per week on agriculture.

Table 4. Moderator values defining Johnson–Neyman significance regions.

Interaction	Johnson–Neyman Significance Region			Effect
	Value	% Below	% Above	
EXP × EK	−1.315	9.333	90.667	0.242~
EXP × EV				NS
EXP × RF				NS
Age × EK	−1.388	8.553	91.447	0.256~
Age × EV				NS
Age × FR				NS
Time × EK	−0.909	15.789	84.211	0.164~
Time × EV				NS
Time × FR				NS

Note: EXP represents experience in agriculture, Age represents the farmers' age, and Time represents time spent per week on agriculture. NS stands for not significant.

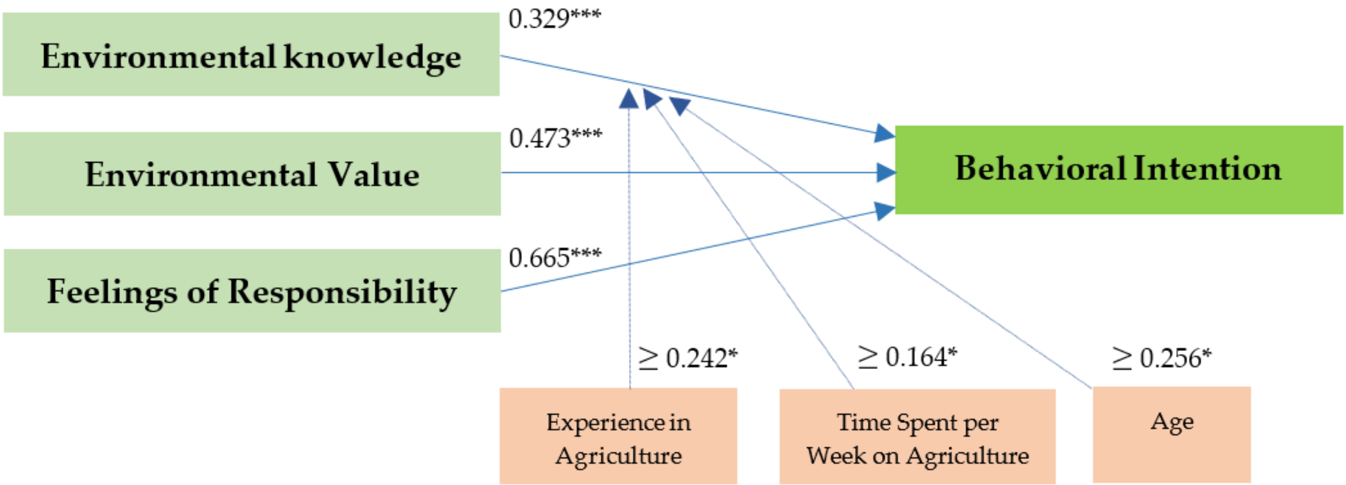

Figure 3. Influences of the moderator variables on the study model. Note: * indicates $p < 0.05$; *** indicates $p < 0.001$.

4. Discussion

The regression analysis revealed that, in farmers' decision-making processes, EK, EV, and FR sufficiently influenced BI. The more the farmers knew about organic agriculture, the stronger their environmental value appraisal and responsibility toward self-empowerment; therefore, the more likely they were to develop behavioral intentions toward organic agriculture. This finding is in agreement with that of Kaiser et al. (1999) [20], who showed that EK, EV, and FR positively and significantly influenced EBI. In keeping with the empirical study of Lin (2016) on indigenous farmers from Hualien and Yilan counties [35], our overall model showed that FR had the greatest effect on farmers' BI toward organic agriculture. Moreover, as in the Savari, Sheheytavi, and Amghani (2023) and Savari and Gharechaee (2020) studies [36,37], moral norms are an important determinant of farmers' behavioral intentions. Therefore, suitable educational or consultancy programs on organic agriculture can emphasize the improvement and development of management concepts, skills, outcomes, and knowledge of organic agriculture; they can also amplify the influences of EV and FR on farmers' decision making. As farmers deepen their understanding of environmental issues related to their farmland, they can explore feasible solutions or action plans and develop their FR and values toward organic agriculture, thereby increasing their BI toward participating in this form of agriculture.

The positive, significant, and direct influence of EK on BI indicates that improving farmers' knowledge enhanced their intentions to adopt organic-agriculture-related behaviors. This finding is in line with that of Tama et al. (2021) [38], who found that experience in agriculture, age, and time spent on agriculture moderated the relationship between EK and BI. Organic farmers emphasize the management of farming practices suited to place and time, and they mostly apply their EK to local conditions and daily experiences in their agricultural practices. The accumulation of practical knowledge of agriculture increases with age, experience, and time, and it may allow farmers to understand more about the negative impacts of industrial agriculture on nature and food security. In turn, this may increase their intention to adopt organic agriculture. Moreover, our survey revealed that most of the farmers saved a portion of their organic produce for personal consumption. Huang (2013) [39] observed a similar phenomenon in their study, finding that Taiwanese grassroots farmers understood the negative effects of industrial agriculture on farmland and human health thanks to their personal experiences. As a result, they cultivated organic food for themselves while also supplying their produce to the market. Based on this evidence, improving farmers' EK about organic agriculture by incorporating their real-life experiences may strengthen their intention to adopt organic agriculture.

The core of organic agriculture is maintaining the sustainability of agricultural operations and the environment. In practice, organic agriculture production processes are rooted in an understanding of agricultural and ecological knowledge and principles, such as applying nonchemical approaches to land management and weed control. Long-term and sustainable agricultural operations can be accomplished by striking a balance between environmental and economic goals. Taiwan has an aging agricultural workforce and a declining workforce size. Despite this, experienced farmers may play an important role in the progress toward sustainable development in agriculture.

5. Conclusions

This empirical study applied Kaiser et al.'s theory of ecological behavior as a basis for examining the decision-making models of farmers' behavioral intentions to adopt organic agriculture. The results indicated that EK, EV, and FR positively, significantly, and directly influenced farmers' behavioral intentions toward organic agriculture, with FR having the greatest effect size. The influence of EV was strengthened by farmers' experience, age, and time spent weekly on agriculture. Measures such as implementing practical educational programs on organic agriculture can impart environmental knowledge to the farmers and help instill in them a feeling of responsibility toward sustaining the quality of agricultural environments; they can also establish their environmental values. These approaches are necessary for competent authorities or agriculture promotion organizations to implement eco-friendly agricultural environment management strategies.

Author Contributions: Conceptualization, P.-C.W. and F.-C.L.; methodology, P.-C.W. and F.-C.L.; statistical and related data analysis, F.-C.L. and D.-C.L.; investigation, F.-C.L.; data curation, F.-C.L.; consult, M.-Y.L. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki and approved by the Institutional Review Board of St. Martin De Porres Hospital (IRB No.: 20C-004).

Data Availability Statement: The data are available upon request via email or phone to the corresponding author.

Acknowledgments: We are grateful to the farmers who participated in this project. We also appreciate all research assistants who helped this project. Furthermore, we would like to thank the reviewers for their insightful and constructive comments to improve the quality of this paper.

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

References

1. National Statistics Republic of China (Taiwan). Preliminary Findings of 2020 Agricultural, Forestry, Fishery and Husbandry Census. Available online: https://ws.dgbas.gov.tw/public/Data/dgbas04/bc1/2020census/2020census/%E5%88%9D%E6%AD%A5%E5%A0%B1%E5%91%8A/109%E5%B9%B4%E8%BE%B2%E6%99%AE%E5%88%9D%E5%A0%B1%E5%88%86%E6%9E%90_%E6%8F%90%E8%A6%81%E5%88%86%E6%9E%90.pdf (accessed on 20 June 2021).
2. Paull, J. Attending the first organic agriculture course: Rudolf Steiner's agriculture course at Koberwitz, 1924. *Eur. J. Soc. Sci.* **2011**, *21*, 64–70.
3. Paull, J. Lord Northbourne, the man who invented organic farming, a biography. *J. Org. Syst.* **2014**, *9*, 31–53.
4. Food and Agriculture Organization of the United Nations (FAO). FAQ. 1999. Available online: https://www.fao.org/organicag/oa-faq/oa-faq1/en (accessed on 23 February 2023).
5. Wang, C.-H. The connotation and production techniques of organic agriculture. In Proceedings of the Symposium on Organic and Eco-Friendly Farming, Changhua County, Taiwan, 14 September 2018; pp. 107–123.
6. Kiprutto, N.; Rotich, L.K.; Riungu, G.K. Agriculture, climate change and food security. *Open Access Lib. J.* **2015**, *2*, e1472. [CrossRef]
7. Gomiero, T.; Pimentel, D.; Paoletti, M.G. Environmental impact of different agricultural management practices: Conventional vs. Organic agriculture. *Crit. Rev. Plant Sci.* **2011**, *30*, 95–124. [CrossRef]
8. Stolze, M.; Piorr, A.; Häring, A.; Dabbert, S. The environmental impact of organic farming in Europe. In *Organic Farming in Europe: Economics and Policy*; University of Hohenheim: Stuttgart, Germany, 2000; Volume 6.

9. Peyton, R.B.; Hungerford, H.R. *An Assessment of Teachers' Abilities to Identify, Teach, and Implement Environmental Action Skills*; Southern Illinois University: Carbondale, IL, USA, 1977.
10. Stern, P.C. New environmental theories: Toward a coherent theory of environmentally significant behavior. *J. Soc. Issues* **2000**, *56*, 407–424. [CrossRef]
11. Hungerford, H.R.; Volk, T.L. Changing learner behavior through environmental education. *J. Environ. Educ.* **1990**, *21*, 8–21. [CrossRef]
12. Best, H. Organic agriculture and the conventionalization hypothesis: A case study from West Germany. *Agric. Hum. Values* **2008**, *25*, 95–106. [CrossRef]
13. Kings, D.; Ilbery, B. Organic and conventional farmers' attitudes towards agricultural sustainability. In *Organic Farming and Food Production*; Konvalina, P., Ed.; IntechOpen: Rijeka, Croatia, 2012; pp. 121–144.
14. Serebrennikov, D.; Thorne, F.; Kallas, Z.; McCarthy, S.N. Factors influencing adoption of sustainable farming practices in Europe: A systemic review of empirical literature. *Sustainability* **2020**, *12*, 9719. [CrossRef]
15. Sapbamrer, R.; Thammachai, A. A systematic review of factors influencing farmers' adoption of organic farming. *Sustainability* **2021**, *13*, 3842. [CrossRef]
16. Stern, P.C.; Dietz, T.; Abel, T.; Guagnano, G.; Kalof, L. A value-belief-norm theory of support for social movements: The case of environmentalism. *Hum. Ecol. Rev.* **1999**, *6*, 81–97.
17. Hines, J.M.; Hungerford, H.R.; Tomera, A.N. Analysis and synthesis of research on responsible environmental behavior: A meta-analysis. *J. Environ. Educ.* **1987**, *18*, 1–8. [CrossRef]
18. Fishbein, M.; Ajzen, I. *Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research*; Addison-Wesley: Reading, MA, USA, 1980.
19. Ajzen, I. The theory of planned behavior. *Organ. Behav. Hum. Decis. Process* **1991**, *50*, 179–211. [CrossRef]
20. Kaiser, F.G.; Ranney, M.; Hartig, T.; Bowler, P.A. Ecological behavior, environmental attitude, and feelings of responsibility for the environment. *Eur. Psychol.* **1999**, *4*, 59–74. [CrossRef]
21. Kaiser, F.G.; Hübner, G.; Bogner, F.X. Contrasting the Theory of planned behavior with the value-belief-norm model in explaining conservation behavior 1. *J. Appl. Soc. Psychol.* **2005**, *35*, 2150–2170. [CrossRef]
22. Cronin, J.J.; Brady, M.K.; Hult, G.T.M. Assessing the effects of quality, value, and customer satisfaction on consumer behavioral intentions in service environments. *J. Retail.* **2000**, *76*, 193–218. [CrossRef]
23. Lam, S.-P. Why are the observed correlations between environmental knowledge and environmental behavior so low? And how to increase them? *J. Environ. Educ. Res.* **2014**, *10*, 1–26.
24. Kaiser, F.G.; Wölfing, S.; Fuhrer, U. Environmental attitude and ecological behaviour. *J. Environ. Psychol.* **1999**, *19*, 1–19. [CrossRef]
25. Stern, P.C.; Dietz, T. The value basis of environmental concern. *J. Soc. Issues* **1994**, *50*, 65–84. [CrossRef]
26. Schultz, P.W.; Zelezny, L. Values as predictors of environmental attitudes: Evidence for consistency across 14 countries. *J. Environ. Psychol.* **1999**, *19*, 255–265. [CrossRef]
27. Hellison, D.; Wright, P. *Assessment and Evaluation Strategies. Teaching Personal and Social Responsibility*, 3rd ed.; Human Kinetics: Champaign, IL, USA, 2011; pp. 161–182.
28. Venkatesh, V.; Morris, M.G.; Davis, G.B.; Davis, F.D. User acceptance of information technology: Toward a unified view. *MIS Q.* **2003**, *27*, 425–478. [CrossRef]
29. Rather, R.A.; Hollebeek, L.D. Customers' service-related engagement, experience, and behavioral intent: Moderating role of age. *J. Retail. Consum. Serv.* **2021**, *60*, 102453. [CrossRef]
30. Molinillo, S.; Aguilar-Illescas, R.; Anaya-Sánchez, R.; Liébana-Cabanillas, F. Social commerce website design, perceived value and loyalty behavior intentions: The moderating roles of gender, age and frequency of use. *J. Retail. Consum. Serv.* **2021**, *63*, 102404. [CrossRef]
31. Wang, L.H.; Yeh, S.S.; Chen, K.Y.; Huan, T.C. Tourists' travel intention: Revisiting the TPB model with age and perceived risk as moderator and attitude as mediator. *Tour. Rev.* **2022**, *77*, 877–896. [CrossRef]
32. Venkatesh, V.; Bala, H. Technology acceptance model 3 and a research agenda on interventions. *Decis. Sci.* **2008**, *39*, 273–315. [CrossRef]
33. Cohen, J. *Statistical Power Analysis for the Behavioral Sciences*, 2nd ed.; Lawrence Erlbaum Associates: Hillsdale, NJ, USA, 1988.
34. Li, M.N.F. Quality control for quantitative studies: Power and effect size analysis. *J. Rea Elem. Second. Educ.* **2002**, *8*, 1–24.
35. Lin, C.-M. A study of influence on Hualien-Yilan indigenous farmers' intention to adopt organic farming. *J. Taiwan Indig. Stud. Assoc.* **2016**, *6*, 101–133.
36. Savari, M.; Sheheytavi, A.; Amghani, M.S. Promotion of adopting preventive behavioral intention toward biodiversity degradation among Iranian farmers. *Glob. Ecol. Conserv.* **2023**, *43*, e02450. [CrossRef]
37. Savari, M.; Gharechaee, H. Application of the extended theory of planned behavior to predict Iranian farmers' intention for safe use of chemical fertilizers. *J. Clean. Prod.* **2020**, *263*, 121512. [CrossRef]

38. Tama, R.A.Z.; Ying, L.; Yu, M.; Hoque, M.M.; Adnan, K.M.M.; Sarker, S.A. Assessing farmers' intention towards conservation agriculture by using the extended theory of planned behavior. *J. Environ. Manag.* **2021**, *280*, 111654. [CrossRef]
39. Huang, S.M. The development of organic farming in Taiwan: A history of scientific paradigm shifts. *Taiwan J. Anthropol.* **2013**, *11*, 9–34.