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Factors Influencing Conventional Hazelnut Farmers to Transition to Organic Production: The Case of Türkiye

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Abstract
This study examined the willingness of conventional hazelnut farmers to transition to organic hazelnut production and identified key factors for stimulating such a shift. Face-to-face interviews based on a structured questionnaire were conducted with Turkish farmers who use conventional methods of hazelnut production. A total of 120 interviews were conducted and subjected to data analysis. Logit analysis revealed that the farmers' decision to transition to organic farming is significantly influenced by several demographic factors (including farmer's experience, available family labour, available land for organic farming and sufficiency of tools and equipment) and attitudinal predispositions (holding a positive attitude towards organic agriculture). Findings suggest the need for policy actions to support a more willing acceptance of organic farming practices among conventional hazelnut growers, with anticipated positive effects on both the environment and consumer demand.

Keywords Organic farming · Farmers' attitudes · Sustainable practices · Agri-food policy · Consumer preferences and behaviour

Introduction

Worldwide, there has been an increase in agricultural productivity in the last 50 years given the growing adoption of modern agricultural science and technologies. The production of cereal crops, such as rice in Asia, maize in Africa and Asia and wheat around the world, has risen approximately threefold (Pingali and Heisey 2001; Grote et al. 2021). Nevertheless, this increased productivity has also been accompanied by the intensive use of chemical inputs (Akbay et al. 2022), resulting in ecological problems, including pollution (Aytop 2022), water and soil degradation (Aytop and Şenol 2022), and, ultimately, climate change (Bourne 2009; Kerr 2012; Shiva 2016). Consequently, food producers and consumers have started demanding agricultural products free from chemical inputs that do not harm the environment and public health. Accordingly, the Food and Agriculture Organization (FAO 2011) recommended the adoption of sustainable agricultural methods to satisfy the demand for healthier and more sustainable foods among the increasing world population (Godfray and Garnett 2014).

Such growing concerns about environmental sustainability and food safety can be addressed through the agricultural practice of organic farming (Vaarst 2010). Organic farming is a production system that emphasises using off-farm inputs and techniques adapted to regional specifics. Furthermore, organic farming uses agronomic, biological and mechanical methods rather than synthetic materials to fulfil any specific function within a production system (FAO 2009). Numerous studies have enquired into the significant differences between organic and conventional farming (Condron et al. 2000; Demiryürek and Ceyhan 2008; Demiryürek 2010; Venkat 2012; Pimentel and Burgess 2014; Schrama et al. 2018; Aydoğan and Demiryürek 2018; Coppola et al. 2020) and have found that organic farming results in higher soil organic matter and nitrogen (Tuomisto et al. 2012) and significantly reduced greenhouse gas (GHG) emissions (Kontopoulou et al. 2015; Squalli and Adamkiewicz 2018; Jeswani et al. 2018; Skinner et al. 2019). However, other studies have shown that organic farming requires a higher total labour force (Eyhorn et al. 2007; Cisilino and Madau 2007;

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Demiryürek and Ceyhan 2008; Crowder and Reganold 2015) and that its yields are, on average, 25% lower than those of conventional farming (Eline et al. 2009; Alvarez 2021). Nevertheless, such yields are more stable than those produced by conventional agriculture (Jouzi et al. 2017), and organic farmers can earn higher incomes thanks to the greater market appreciation for organic products, which are priced at a premium (Barrett et al. 2002; Argilés and Brown 2007; Cranfield et al. 2010; Gillespie and Nehring 2013; Mishra et al. 2018). In addition, using environmentally friendly inputs renders organic farming more sustainable and eco-friendly than conventional farming (Manimozhi and Gayathri 2012; Mishra 2013; Testa et al. 2015; Sgroi et al. 2015; Soni and Yadav 2019).

According to FAOSTAT (2020), 187 countries practice organic farming over 72.3 million hectares of agricultural land, earning 106 billion euros in 2019. Note that this expanse of land represents only 1.5% of the total agricultural land (FIBL and IFOAM). Over the past 17 years, the land area devoted to organic agricultural practices in Türkiye has increased more than sixfold, from 89,827 ha in 2002 to 545,870 ha in 2019. Despite this development, the country has not reached its 3% production target. As of 2019, the share of organic agricultural products from the country's total agricultural output was approximately 2% (TOB 2020).

The largest producers of organic fruits globally are Italy, Türkiye, the USA, France, Spain, Poland and Germany (FIBL and IFOAM 2020). At the beginning of organic farming in Türkiye, farmers cultivated organic grapes, followed by figs, hazelnuts, and apricots (Özbağ 2010; Merdan 2014). With respect to hazelnuts, Türkiye is a top producer and exporter in the world, generating 665 thousand tons in 2020 (FAOSTAT 2020). It exports 77% of its hazelnut supply to the EU and the world. The largest distribution goes to the European Union and the United Kingdom (78%), while Germany and Italy account for 50% of the country's distribution (FIBL and IFOAM 2020). In 2020, Turkish hazelnut exports were valued at more than US$1.247 billion, accounting for 7% of the total value of agricultural exports from the country (TURKSTAT 2020). In 2020, however, the share of hazelnuts produced by conventional farming was 97.5%, while that generated via organic farming was only 2.5% (TOB 2020).

The demand for hazelnuts has increased worldwide (Mennan et al 2020; Nalange and Gaikwad 2020; Guliyev et al 2019). Consumers are willing to pay higher prices for organic hazelnuts given concerns over healthy diets (Padel and Foster 2005; Golijan and Veličković 2015) and environmental issues (Nuttavuthisit and Thøgersen 2017; Schäufele and Hamm 2018; Ditlevsen et al. 2019). This Concerns for the environment and the better taste of organic hazelnuts also drive the preference for this product among local consumers (Zepeda and Deal 2009; Jánská et al. 2020; Ditlevsen et al. 2020). Besides people's willingness to consume healthy and environmentally friendly products, the growth of the chocolate and confectionery industries are also amongst the most significant factors for this increase (Bregaglio et al. 2016). What is more, Giresun's 'Chubby' Hazelnut was registered by the European Union Commission as a geographically indicated product (Turkish Patent and Trademark Office 2023). Promotion and advertisement of geographically indicated products by national institutions and organizations creates new opportunities for further increase in product consumption in domestic and foreign markets (Aytop and Çankaya 2022).

Notwithstanding the numerous studies on farmers' intention to adopt organic production (e.g., Duram 2000; Pancino and Cristofori 2008; Läpple and Kelly 2010), none of the studies have been conducted in the context of hazelnut organic farming in general, and in Türkiye in particular. Given the nutritional value, consumers' and food industry growing demands for the organically grown product, and the impact of farming methods on the environment, more research is needed on this topic. The present research addresses these knowledge gaps by examining the willingness of conventional hazelnut farmers to transition to organic hazelnut production and exploring a number of factors that may affect conventional hazelnut producers to convert to organic hazelnut production.

The key contribution of this study is ascertaining the effects of conventional hazelnut farmers' attitudes toward organic hazelnut production. The findings can also help raise farmers' awareness regarding the benefits of organic farming for their farms and livelihoods, as well as help them make more informed decisions about shifting from conventional to organic farming. Furthermore, the study provides valuable insights into current conventional and organic farming practices, links them to existing empirical studies and provides important information for policymaking on national level and beyond. The remainder of the article is organized as follows. First, a review of organic farming in existing studies and the development of the research hypotheses are presented. Next, the study methodology is outlined. Finally, the study results are discussed and the conclusions are presented.

Literature Review and Hypotheses Development

Literature Review

Previous studies have shown that diverse factors drive farmers to transition to organic farming, and thus, there is a multitude of discussions about these factors. First, it is nec-

essary to highlight the economic factors, which play an important role in the decision to convert to organic farming. Studies show that organic agriculture is more profitable than conventional agriculture (Padel 2010; Reganold and Wachter 2016; Smith et al. 2019; Tscharntke et al. 2021). Farmers can sell their organic produce at higher prices while operating at lower production costs (Padel 2001). However, some farmers may still be economically irrational. Although the selling price of organic produce is higher than that of produce grown using other methods, farmers are not willing to convert to organic farming because the yield is lower (Herath and Wijekoon 2013). This indicates the possibility that farmers might not be able to evaluate the benefits of organic farming correctly.

Second, there is an argument that marketing and providing information about organic farming are more important than financial support allocated by governments (Qiao et al. 2019). Similarly, Demiryürek (2010) stated that the main barrier for farmers to convert to organic farming is the lack of information about organic farming and 'support from public extension agencies'. It has been reported that the cost of seeking information is a severe and main barrier against the adoption of organic farming (Cranfield et al. 2010; Issa and Hamm 2017; Yazdanpanah et al. 2022). Thus, farmers accessing information about organic farming are more likely to convert to organic farming (Kallas et al. 2010). Moreover, institutional support plays a major role in converting to organic farming. With the support received from the government, farmers are more likely willing to convert to organic farming (Reddy 2010; Sapbamrer and Thammachai 2021).

In addition to the factors noted above, there are other factors affecting farmers' decision to adopt of organic farming. For example, attitudes towards the environment may positively affect the adoption of organic farming (Läpple and Van Rensburg 2011; Wollni and Andersson 2014; Ashari Sharifuddin et al. 2019). Also, socio-demographic factors affect the decision of farmers (Azam 2015; Digal and Placencia 2019; Oyewole and Sennuga 2020; Zhllima et al. 2021). In fact, Läpple and Kelley (2010) highlighted that social pressure and farmers' attitudes had a significant impact on farmers converting to organic farming.

Accordingly, this study pursues the following research objectives: first, to determine the willingness of conventional hazelnut farmers to transition to organic hazelnut production; second, to determine the factors that affect conventional hazelnut producers to convert to organic hazelnut production; and third, to test the developed hypotheses with a large-scale national sample. By exploring these issues, the study contributes to the theoretical development and empirical evidence in organic farming.

Hypothesis Development

Farmers' Sociodemographic Characteristics

Organic farming incorporates a complex natural relationship, cultivating ability, and agricultural experience (Schneeberger et al. 2002). Experience is an important factor affecting farmers' willingness to convert to organic farming. Previous studies have shown a positive correlation between agricultural experience and the willingness to convert to organic farming (Fairweather 1999; Wheeler 2008; Ghane et al. 2009; Veisi et al. 2010; Etehadi et al. 2011).

Age is another important variable when farmers decide on their production method. Age positively affects farmers' valuation regarding the adoption of organic farming (Genius et al. 2006; Sodjinou et al. 2015; Ullah et al. 2015; Sapbamrer and Thammachai 2021). However, other studies have found that the empirical evidence is not conclusive as to whether age is a driver or a barrier (Serebrennikov et al. 2020; Tsai et al. 2021).

Regarding education level, previous studies show that there is a positive correlation between education and adopting organic farming. This is in line with similar findings from Karki et al. (2011), who pointed out that more educated farmers are more likely to convert to organic farming. However, Khaledi et al. (2010) stated that education levels had no significant effect on the probability of conversion.

H_{1a}: Farmers' experience has a positive effect on their willingness to convert to organic hazelnut production.

H_{1b}: Farmers' age has a positive effect on their willingness to convert to organic hazelnut production.

H_{1c}: Farmers' education has a positive effect on their willingness to convert to organic hazelnut production.

Organic farming is a labour-intensive agricultural production method, and family size has a positive effect, particularly for labour-intensive agricultural production methods. In addition, farmers with larger families need a lower hired workforce, which helps to reduce labor costs (Anderson et al. 2005; Tiffin and Balcombe 2011; Läpple and Van Rensburg 2011; Reissig et al. 2016). The number of people actively working in agriculture with their families plays a positive role in the adoption of organic farming. This is supported by Schewe (2015), who stated that organic producers have reverted to a heavy reliance on available family labour. As a result, farmers with large families and available family labour are more likely to convert to organic hazelnut production.

H_{2a}: Farmer family size has a positive effect on the willingness to convert to organic production.

H_{2b}: Available family labour has a positive effect on the willingness to convert to organic hazelnut production.

Farm Characteristics

Farm size plays an important role when farmers are willing to adapt to organic farming. Pietola and Lansink (2001) stated that farmers with a large agricultural area are more willing to convert their production method to organic farming, and this is supported by Gardebroek and Lansink (2003), who stated that having a large area of land increases the probability of converting to organic farming in the Dutch. On the other hand, Läpple and Kelley (2010) stated that there is a negative correlation between land size and conversion to organic farming. In addition, McBride and Greene (2009) found that farmers with less agricultural land are more likely to convert to organic farming.

H_3: Farm size has a positive effect on the willingness to convert to organic hazelnut production.

Agricultural lands for organic farming should be at a distance that is not affected by traditional agricultural areas, main roads, industrial facilities and underground waters containing polluting wastes (Schmutz et al. 2014; Brković et al. 2016). Farmers with suitable land far from urban areas and industry are more willing to convert to organic farming (Gabriel et al. 2009; Wollni and Andersson 2014).

H_4: Having suitable land has a positive effect on the willingness to convert to organic production.

H_5: Having enough equipment has a positive effect on the willingness to convert to organic production.

H_6: Farmers' location has a positive effect on the willingness to convert to organic production.

Attitudes Toward Organic Farming

Identifying farmers' attitudes towards organic agriculture is another important factor affecting farmers' conversion to organic farming. Farmers' attitudes toward organic agriculture are influenced by a variety of external factors, including friends, extension services, sources of information, and training (Läpple and Kelley 2010). This is in line with Pancino and Cristofori (2008), who found that the main reason why farmers are not willing to convert to organic farming is that they have a traditionalist mentality with respect to conventions and practices.

H_7: Farmers' positive attitude toward organic farming has a positive effect on their willingness to convert to organic hazelnut production.

Study Methodology

Procedure

The study data were obtained from a cross-sectional survey via face-to-face interviews with farmers producing hazelnuts under the conventional method of production. The proportional sample size formula was used to determine the sample size of the farmers to be interviewed (Newbold et al. 2010).

The hazelnuts produced in Samsun, Ordu and Giresun provinces provide approximately 70% of the total hazelnut production in Türkiye. The number of farmers producing hazelnuts is 262,113 people. Accordingly, the sample size is calculated as 120 for a 90% confidence interval and 7.5% error margin. In the formula, n is sample size, N is number of farmers, σ^2_{px} is the variance of the ratio, and p is the ratio of hazelnut producers ($p = 0.05$ to reach the maximum sample size).

$$n = \frac{Np\,(1-p)}{(N-1)\sigma^2_{\widehat{p}_x} + p(1-p)}$$

Methods

One-way analysis of variance (ANOVA) was used to compare hazelnut farmers' socioeconomic and farm characteristics. The binary logit model was used to determine the factors affecting the willingness to convert to organic hazelnut production (yes, no). In binary logit, the willingness to convert to organic hazelnut production value was accepted as dependent variables; age, education level, available family labour, family size, farmers' experience having suitable land and equipment, farm location, and attitude towards organic agriculture were accepted as independent variables.

Results and Discussion

Farmer Characteristics

The sociodemographic characteristics of the farmers (age, education level, available family labour, family size, farmers' experience, and monthly household income) in the provinces were analysed separately by the one-way ANOVA test in Table 1.

Approximately 97.22% of those surveyed were male, and 94.44% were married. The average age of the farmers was 52.93, and the average agricultural production experience of farmers was 32.21. In addition, the average education level of the farmers was 6.95 years, and the producers in Giresun were more educated than farmers in other provinces. This is in line with similar findings from Kılıç et al. (2009), who

Table 1 Sociodemographic characteristics of hazelnut producers by province

Variables	Giresun	Ordu	Samsun	Total
Age (years)				
Mean	53.36	52.36	53.48	52.93
Std. deviation	7.11	8.68	11.67	9.02
Minimum	40	33	30	30
Maximum	76	78	83	83
Education (years)				
Mean	7.38	6.85	6.59	6.95
Std. deviation	3.45	3.46	3.19	3.38
Minimum	5.00	0.00	5.00	0.00
Maximum	16.00	16.00	14.00	16.00
Available family labour				
Mean	2.81	2.62	2.93	2.75
Std. deviation	1.33	1.22	1.73	1.39
Minimum	1	0	1	0
Maximum	8	5	8	8
Family size				
Mean	4.92	4.38	4.21	4.50
Std. deviation	1.86	1.24	2.32	1.75
Minimum	2	2	1	1
Maximum	10	7	11	11
Agricultural production experience (years)				
Mean	32.06	32.40	32.03	32.21
Std. deviation	10.52	10.08	14.24	1.24
Minimum	5	13	4	4
Maximum	60	60	60	60
Household monthly income ($)				
Mean	856.22	895.14	737.17	845.29
Std. deviation	348.61	542.67	628.20	516.01
Minimum	340.91	426.14	142.05	142.05
Maximum	17,6136	426,136	2840.91	4261.36
Marital status (%)				
Single	5.56	1.82	0.00	2.50
Married	94.44	98.18	100.00	97.50
Total	100.00	100.00	100.00	100.00
Gender (%)				
Female	2.78	5.45	3.45	4.17
Male	97.22	94.55	96.55	95.83
Total	100.00	100.00	100.00	100.00

found that the average age of hazelnut farmers is 51.78, and the education level is 6.62 in Samsun. In another study carried out in Samsun province, it was determined that 94.74% of farmers are married, the average age of those is 55.75, and the level of education is 7 (Altunpala and Bozoğlu 2018).

The mean family size was approximately 4.50 people, while the number of people working in agriculture in the family was 2.75. The mean family size is 4.37 in Samsun

Table 2 Average farm size by province (ha)

Provinces	Average farm size (ha)	Average hazelnut planting farm size (ha)	Hazelnuts production area in total land (%)
Giresun	3.63	2.92	80.47
Ordu	2.45	2.15	87.59
Samsun	3.71	3.16	85.06
Total	3.11	2.62	84.36

(Kılıç et al. 2009). Furthermore, the monthly average household income of the farmers was $845.29. Demir (2016) found that the monthly mean family income is $608.65.

Farm Characteristics

The average farm size was 3.11 ha, and the farm size (3.71 ha) in Samsun Province was larger than that in the other provinces. On the other hand, farmers with the smallest farm size were located in Ordu Province, with 2.45 ha (Table 2). The results related to the farm size variable were similar to the results of previous studies (Sıray and Akçay 2010; Demir 2016; Altunpala and Bozoğlu 2018). The average hazelnut farm size was approximately 2.62 ha, hazelnuts were ranked as the first product, and producers allocated 84.36% of their land. This result is supported by Kılıç et al. (2009). They found that the average land size of hazelnut producers is 2.75 ha. In addition, Sıray and Akçay (2010) stated that the area of hazelnut production consists of 98% of the total production area.

Hazelnut Production Information

The yield of hazelnuts on the average land (2.62 ha) was 1255.40 kg/ha, and the average selling price of hazelnuts was 2.59 $/kg (Table 3). The average yield of hazelnut is 710 kg/ha in Giresun, 1000 kg/ha in Samsun and 860 kg/ha in Ordu (TURKSTAT 2021). Farmers producing hazelnut by organic methods sell their products at 7.5 €/kg, and the market price of conventional hazelnut is 5.9 €/kg in Italy (Coppola et al. 2020).

Table 3 Conventional hazelnut production information

Variables	Mean
Hazelnuts production land (ha)	2.62
Hazelnuts yield (kg/ha)	1255.40
Hazelnuts sale price ($/kg)	2.59
Number of days worked in hazelnuts production per year (day)	56.83
Percentage of farmers needing hired workforce (%)	88.33
Number of the hired workforce needed in hazelnuts production	13.73

Table 4 Information about willingness to produce organic hazelnut

Variables	Mean
Having suitable land for organic farming (%)	78.33
Having enough tools and equipment for organic agriculture (%)	39.17
Farmers who want to convert to organic hazelnuts production (%)	35.83

Hazelnut producers allocated 56.83 days in a year for production. Moreover, 88.33% of farmers reported needing hired labour for hazelnut production, and the hired labour force was 13.73 people (Table 3). In the research comparing the sustainability of hazelnut, the number of the hired workforce of the hazelnut producers with low sustainability is 20.0 people, while the number of people in the hired work-

Table 5 Dependent and independent variables included in the binary logit model

Variable	Explanation	Mean	Std. Dev
The dependent variable; Willingness to convert to organic hazelnuts production	Yes = 1 No = 0	0.36	0.482
Independent Variables			
Family size	Continuously variable	4.50	1.749
Farmers' experience (years)	Continuously variable	32.21	11.244
Available family labour	Continuously variable	2.75	1.386
Member of the agricultural cooperatives	Yes = 1 No = 0	0.62	0.486
Age	Continuously variable	51.90	10.235
Education	Continuously variable	6.97	3.348
D_Ordu[a]	Hazelnuts producers in Ordu yes = 1 otherwise = 0	0.46	0.500
D_Giresun	Hazelnuts producers in Giresun yes = 1 otherwise = 0	0.30	0.460
D_Samsun	Hazelnuts producers in Samsun yes = 1 otherwise = 0	0.24	0.430
Farm size (da)	Continuously variable	31.08	32.922
Land is suitable for organic farming	Yes = 1 No = 0	0.78	0.414
Having equipment for organic farming	Yes = 1 No = 0	0.39	0.490
Given the definition of organic farming	Yes = 1 No = 0	0.42	0.495
Positive attitude towards organic agriculture	5-point Likert	3.47	0.593

[a]Reference group

Table 6 Binary logit analysis of the factors affecting the willingness to convert to organic farming

Variables	B	S.E.	Wald	Sig	Exp(B)
Age	0.033	0.056	0.348	0.555	1.033
Education	–0.034	0.097	0.120	0.729	0.967
Family size	0.396	0.243	2.665	0.103	1.487
Available family labour	–0.855	0.327	6.860	0.009**	0.425
Experience	–0.108	0.049	4.839	0.028*	0.898
D_Samsun	0.674	0.843	0.640	0.424	1.963
D_Giresun	0.679	0.706	0.924	0.336	1.971
Farm size	0.023	0.009	6.287	0.012*	1.024
Land is suitable for organic farming	3.114	1.249	6.220	0.013*	22.511
Having enough equipment for organic farming	1.891	0.644	8.628	0.003**	6.628
Given the definition of organic farming	–0.425	0.664	0.410	0.522	0.654
Positive attitude towards organic agriculture	2.021	0.785	6.636	0.010*	7.548
Constant	–9.785	4.515	4.697	0.030	0.000
Overall percentage	90.0				
–2 Log-likelihood	75.331				
Cox & Snell R2	0.492				
Nagelkerke R	0.675				
Chi-square	81.258				
(*p*-value)	0.000				

* $p < 0.05$, ** $p < 0.01$

force of the hazelnut producers with high sustainability is 19.4 people (Yıldırım et al. 2022).

Although 78% of farmers had suitable agricultural land and 39.17% had suitable tools and equipment for organic agriculture, the share of farmers who wanted to convert to organic hazelnut production was 35.83% (Table 4). Having suitable farm conditions positively affects the conversion to organic farming (Läpple and Kelley 2013). On the other hand, Wollni and Andersson (2014) stated that farmers having land on hillsides and less fertile soils are more likely to adopt organic farming as the opportunity costs of switching to organic agriculture are lower.

Results of Binary Logit Analysis

The binary logit model determines factors affecting farmers' conversion to organic hazelnut production. The dependent variable in the model is encoded as '1' for those who want to convert to organic production and '0' for those who do not want to convert to organic farming. The number of questionnaires and the chi-square test results were considered when determining the independent variables included in the model. Some of the independent variables used in the model were transformed into dummy variables, while others were included as continuous variables. Explanations, averages and standard deviations of the variables are given in Table 5.

The model shown in Table 6 was statistically significant ($x^2 = 81.258, p < 0.01$). The proportion of dependent variable explanations for independent variables is 90%, which is relatively high for horizontal cross-section data. The values of –2 log-likelihood, Cox-Snell and Nagelkerke R^2 of the model are 75.331, 0.492 and 0.675, respectively. The Cox & Snell R^2 and Nagelkerke R^2 values explain the same as the multiple-regression R^2 values (Field 2005). The Nagelkerke R^2 coefficient is the modified version of the Cox & Snell coefficient to allow the range to change from 0 to 1. For this reason, the value of Nagelkerke R^2 is always higher (Hair et al. 2005; Garson 2008).

The binary logit results are given in Table 6. Six variables in the logit model were statistically significant. The first hypothesis (H_{1a}), which postulates that farmers' experience has a positive effect on willingness to convert to organic hazelnut production, was not supported by the data. Farmers' experience, which was strongly significant at the 5% level and negative, suggests that a 1-year increase in farmers' experience decreased the willingness to convert to organic farming by 10.2%. On the other hand, Singh and Sajwan (2023) found that farmers' experience is an important factor affecting conversion to organic farming. This result is consistent with those of Digal and Placencia (2019) and Giannakis (2014), who find that farmers with more experience are more likely to convert to organic farming. The main reason for this is that farmers have experienced the adverse effects of input-intensive farming on high input costs and environmental degradation. However, Ullah et al. (2015) reported that farmers' experience had no a significant impact on the adoption of organic farming. The second hypothesis (H_{1b}), which postulates that farmers' age has a positive effect on willingness to convert to organic hazelnut production, was not supported by the data. Farmers' age was found to be an insignificant factor in the adoption of organic farming.

The third hypothesis (H_{1c}), which postulates that farmers' education has a positive effect on willingness to convert to organic hazelnut production, was not supported by the data. Farmers' education was found to be an insignificant factor in the adoption of organic farming. The fourth hypothesis, H_{2a} posits that family size has a positive effect on willingness to convert to organic production. This hypothesis was not supported by the data. Farmers' family size was found to be an insignificant factor in the adoption of organic farming.

The fifth hypothesis, H_{2b} posits that available family labour has a positive effect on willingness to convert to organic production. This hypothesis was not supported by the data. The available family labour, which was significant at the 1% level and negative, suggests that a one-person increase in available family labour decreased willingness to convert to organic farming by 57.5% (1-0.425). In contrast to this result, Darnhofer et al. (2005) stated that farmers are not willing to convert to organic farming because of the limited supply of available family labour. As for the shortage of available family labour, farmers believe that production costs will increase as the labour requirements in organic farming are higher than those in conventional farming. However, Schneeberger et al. (2002) found that there was no significant correlation between the adoption of organic farming and available family labour.

The sixth hypothesis, H_3 anticipated that farm size has a positive effect on willingness to convert to organic production. This hypothesis was supported. As for the result of analyzing the "farm size", the value of willingness to convert to organic farming increased by 1.02 as the farm size increased by one hectare. This is in line with similar findings from Tey et al. (2014) and Rajendran et al. (2016). Farmers with larger farm sizes are more willing to convert to organic farming because they are more supported in terms of technical support and financial subsidies. However, some previous studies found that farmers with small land are more willing to convert to organic farming as farmers with large land have difficulty managing their farms (Kallas et al. 2010; Läpple and Van Rensburg 2011; Pradhan et al. 2017; Laosutsan et al. 2019; Chichongue et al. 2020).

The seventh and eighth hypotheses, H_4 and H_5, which stipulate that having suitable land and having enough equip-

ment have a positive effect on willingness to convert to organic production, were supported. The effect of having suitable land was positive for willingness to convert to organic farming and significant at the 5% level. A unit increase in suitable land increased farmers' willingness to convert to organic farming by 22 times. Land for organic farming should be away from roads and industry zones because of contamination (Nabulo et al. 2006; Havugimana et al. 2017; Öztürk and Dengiz 2020). Furthermore, Setboonsarng (2006) stated that farmers living in remote areas use fewer chemical inputs and produce their product almost in an organic way, which means they can adapt more quickly to organic farming. As for having enough equipment, a unit increase in equipment increased farmers' willingness to convert to organic farming by six times. Organic farming is more labour-intensive than conventional farming. Therefore, more workforce is needed. However, the limited labour force in the villages negatively affects the farmers' thoughts about converting to organic agriculture. The existence of tools and equipment instead of a labour force is effective in the conversion in places where there is a shortage of rural labour (Demiryürek and Ceyhan 2008; Akram et al. 2020).

The tenth hypothesis, H_6, posits that farmers' location has a positive effect on willingness to convert to organic production. This hypothesis was not supported by the data. Farmers' location was found to be an insignificant factor in the adoption of organic farming. The eleventh hypothesis, H_7, according to which farmers' positive attitudes toward organic farming will have a positive effect on their willingness to convert to organic hazelnut production, was also supported. As for the result of analyzing the "farmers' positive attitudes toward organic farming", the value of willingness to convert to organic farming increased by seven times as farmers' positive attitudes toward organic farming increased by one unit. This is in line with similar findings from Hattam (2006), Issa and Hamm (2017), Läpple and Van Rensburg (2011) and Cakirli Akyüz and Theuvsen (2020). Farmers who have a positive attitude are likely to adopt organic agriculture in the coming 5 years as they are aware of the benefits of organic agriculture to the environment and human health (Peng 2019; Thakur et al. 2022).

Conclusions

Türkiye is ranked as the world's top producer and exporter of hazelnuts. However, the share of hazelnuts produced by conventional farming exceeds manyfold the share of hazelnuts produced by organic farming. The present study examined the willingness of conventional hazelnut farmers to transition to organic hazelnut production and the factors affecting conventional hazelnut producers' willingness to adopt organic hazelnut production practices.

The study found that transition to organic farming was affected by several factors, such as farmers' experience, farm size, suitable land and equipment, available family labour and a positive attitude towards organic agriculture.

Several implications for hazelnut farmers can be derived from this study. First, farmers expect to have yields under organic farming that are on average lower than those under conventional farming. In this context, they believe that their income from agriculture will be reduced when they adopt organic farming. However, organic farmers can obtain higher income due to the greater market appreciation for organic products that command a premium price. The time between starting organic production and obtaining organic product certification, which is called transition period and is a process of three years in perennial plants. During the transition period, there will be a decrease in the income of the producers due to the decrease in their productivity. Therefore, organic farming adoption should be accelerated by providing agricultural support to conventional hazelnut producers.

Second, available family labour is an important factor when farmers are willing to convert to organic farming. As the income obtained from the agricultural sector is less than in other sectors, and there is the attractiveness of the city, there has been an increase in migration from rural to urban areas. Policies should be put in place to make the countryside more attractive, and young farmers in particular should be encouraged to contribute to agricultural employment, which helps reduce migration from rural areas to urban areas and hidden unemployment.

Third, with regard to farmers' experience, young hazelnut farmers are more willing to adopt organic farming than older farmers. The main reasons for this are that young people are aware of the social and environmental benefits of organic agriculture, and they believe that they can grow better quality and healthier products with organic agriculture.

Fourth, farmers' attitude is one of the most important factors in their decision-making. A positive attitude accelerates the process of adopting innovations such as organic farming. Even though the majority of the producers have agricultural land suitable for farming, have enough tools and equipment for agriculture and have positive attitudes toward organic products, the number of farmers who want to convert to organic production is relatively low. The most important reasons are the low yield of hazelnuts, lack of sufficient knowledge about organic agriculture, and long distance from selling locations.

As the majority of farmers lack information about organic farming, government and non-governmental organizations should raise awareness about organic farming

and its benefits to the environment and consumers' health. Practices such as exemplary farmers, gardens and training should be expanded in rural areas for organic agriculture to be more widely adopted. Specifically, policymakers can better regulate the production method by informing conventional hazelnut producers about organic farming, supporting, for example, the adoption of organic farming and certifications so that producers can make more informed decisions based on the benefits of organic farming.

The study findings point to several potential policy implications for stimulating the production of organic hazelnuts in Türkiye', which is desired by the government as organic hazelnut farming could earn significantly higher income by exporting larger volumes of organic hazelnuts, which are sought after by international markets.

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Declarations

Conflict of interest H. Meral and E. Millan declare that they have no competing interests.

Ethical standards Ethics approval was obtained from the University of Reading. The SAPD Ethical Clearance Application Reference Number is 00746C.

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