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Determination of the Factors Effective in Reaching the Objectives of Agricultural Support: Example of the Wire Trellis Systems in Viticulture Farming in Diyarbakır

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Abstract

Agricultural support is used to increase product diversity, sustainability, productivity, and quality in agricultural production. In 2011, agricultural support from the International Fund for Agricultural Development (IFAD) was given to 79 farmers in Dicle, Hani, Kulp, and Silvan districts to disseminate the wire trellis vineyard system in Diyarbakır province, Türkiye. In this study, based on the willingness of the viticulture farmers to continue the wire trellis system, factors affecting the success of agricultural support were investigated. Study data were obtained from the viticulture farmers, who received the support to establish wire trellis systems, through structured and semi-structured questionnaires during face-to-face interviews in 2020. In the data analysis, descriptive statistics and logistic regression methods were used. Data analysis revealed that 62% of the respondents were willing to continue with wire trellis system in viticulture farming. According to logistic regression results, along with the significant ($p<0.05$) and positive effect of education at secondary or higher schooling, the knowledge level and satisfaction status of the respondent farmers had positive and statistically highly significant effects on their willingness to use wire trellis systems, while the existence of off-farm income sources had a marginally significant but negative effect. In order to harvest the expected outcomes from the support policies, we conclude that it is beneficial to direct the support to young and educated farmers for whom agriculture is the primary source of income, and to accompany this with the relevant extension work so as to enhance the knowledge level of the target farmers.

Keywords Adoption of innovations · Logistic regression · Small-scale farms · Structured and semi-structured interviews · Vineyards

Introduction

The statement "agriculture is the common indispensable element of all societies from ancient times to the present day" is true as agriculture is directly related to the maintenance of humanity and the sustainability of the environment and nature. The dramatic reality of the pandemic that the world has faced for the past years has once again put the focus on agriculture rather than other sectors. Although agricultural production is perceived as a technical activity, it has multidimensional effects on and results in the socioeconomic and sociopolitical spheres. This makes agriculture one of the basic sectors of the economy (Doğan et al. 2015). The agricultural sector, which is so important to human life with its economic, social, and environmental dimensions, is different from other sectors in terms of its structural features. Production in the agricultural sector is cyclical, the risk is very high because it is largely under the influence of nature and climatic conditions, it is highly affected by price fluctuations due to low supply and demand elasticities, specialization is limited, and, in many countries it is more fragile than other sectors because it comprises the lifestyle of farming families and is intertwined with their lives (Tunçer and Günay 2017). Because of the aforemen-

Data Availability Statement Study data will be made available upon reasonable request.

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tioned characteristics of the agricultural sector, withdrawals from agriculture are experienced. As the population growth in late 20th century started to surpass the increases in agricultural productivity, per capita food production gradually decreased in time (Sanchez and Swaminathan 2005). In addition, global food demand is expected to increase two- to fivefold in the period 1990–2030. Parallel to the global situation, the number of farmers decreased by 48% in the past 12 years while the agricultural land decreased by 12.3% in the past 18 years in Türkiye (Bayar 2018). These aforementioned facts and conditions clearly indicate the need for support for agriculture in Türkiye. Thus, the European Union has given priority to the agricultural sector in the use of public resources for the past 50 years (Cooper et al. 2009). In Türkiye, in harmony with the European Union, the highest increase in support payments in 2022 was realized in area-based support payments, such as diesel support, difference in payment support, and the support for products with a supply gap, e.g., viticulture (SBB, 2022).

It is a well-known fact that the farm management decisions of farmers are greatly influenced by agricultural policies and support (Boardman et al. 2003; Evans 1990). However, the introduction of new policies and support and the adoption of agro-environmental plans may not guarantee success in ecological and environmental outcomes (Kleijn and Sutherland 2003; Wilson and Hart 2001) since the agricultural sector has strong historical and traditional ties and, consequently, modernization in agriculture may not make it possible to dispose of or change these patterns at once. Therefore, it is important to understand the factors that affect farmers' adoption of agricultural environmental policies in general.

With a history of nearly 6000 years, viticulture is one of the oldest agricultural activities in Türkiye. With more than 1400 vine genotypes, Türkiye is considered to be one of the motherland countries of the vine grape (Ağaoğlu et al. 1998). Grape is a product that can create added value, and it can be used in various ways, as table grapes, raisins, wine, and juice. However, vineyard areas in Türkiye are gradually decreasing, with old and traditional unproductive vineyards being explanted (Darkot 1963). Nevertheless, despite the decline in vineyard acreage in Türkiye, there has been an increase in total production due to improved productivity. However, this is not the case for the south-eastern Anatolia region of Türkiye, despite ranking third in vineyard acreage in the country. In this region, both acreage and total grape production are decreasing. The use of old and traditional viticultural production techniques is the main reason for this situation in the region (Kiraci and Şenol 2017; Çakır et al. 2017).

Grape productivity in Diyarbakır and its districts is low when compared to the other regions of the country. The reason for this is because new vineyards are not established and the existing ones were installed using traditional unproductive training systems and they have already more or less completed their economic life. Due to the nature of agricultural production, which is a biological process realized under natural conditions, protective and supportive measures and policies are a necessity for the sustainability of the agricultural sector (Yorgun 2006). Accordingly, various policies have been developed to maintain viticulture in the south-eastern region of Türkiye and hence in Diyarbakir province. Projects were supported between 2009 and 2016 on subjects such as protecting existing varieties, expanding production areas, and the introduction and promotion of high-wire cordon trellising for modern and organic viticulture.

Apart from the type of payments and the payment amounts, the benefit level of farmers also influences the effectiveness of agricultural support. Since farmers are directly affected by support policies, there is no doubt that farm-level studies are important in determining how farmers approach the issue (Erdal et al. 2013), the knowledge of which can contribute to macro policy-making.

Materials and Methods

Study Area

The United Nations International Fund for Agricultural Development (IFAD) supported farms in Diyarbakır's Silvan, Hani, Kulp, and Dicle districts in 2011 (Fig. 1). These districts have a relatively mountainous geography and thus the average farmland size is smaller than in the rest of the province, with a considerably flat or gently undulating terrain. Viticulture farming in this region has commonly been a secondary source of farm income for centuries and experienced with a traditional viticulture training system, known as "Serpene." This training system is a different version of the traditional Goble training system with higher trunk height and more buds left during pruning (Karataş Değirmenci et al. 2015). Traditional viticulture farming in the region is low yielding, not suitable for mechanization, and labor intensive. Farmers were supported by the IFAD at a rate of 70% of the vineyard establishment costs for the adoption of wire trellis systems in viticulture. The IFAD support was paid to make farmers adopt the wire trellis system as an innovation in viticulture farming in the place of the traditional training viticulture system. Thus, in this study, we aimed to determine the factors affecting the willingness of farmers to continue with the wire trellis–training viticulture system as a proxy of the achievement of the agricultural support. In doing this, we tested the hypothesis that support alone is not effective in changing the behavior of the farmers.

Fig. 1 Study area

The study area covers the Hani, Kulp, Silvan, and Dicle districts of Diyarbakır. The sampling frame covers all viticulture farms that used IFAD grants. The IFAD's priority target group is defined as the poorest rural people with productive potential. Grants from the IFAD are directed not only to the chronically poor, but also to those at risk of becoming poor (IFAD 2022). In this context, IFAD grants were given to the farmers growing apple, almond, walnut, and grapevine in their small, over-fragmented, and dispersed farmland in Silvan, Hani, Kulp, Dicle, and Eğil districts of Diyarbakır province during the period 2006–2015.

Material

The study was carried out in two stages. In the first stage, after the relevant literature review, the conceptual framework of the study was designed. After the hypotheses were formed, the necessary data were collected in the second stage of the study.

A complete enumeration sampling method was used due to the manageable population size (Çiçek and Erkan 1996; Gökçe 1988). Face-to-face interviews were held with all of the 79 farmers who benefited from IFAD grants to establish vineyards using wire trellis–training systems under the supervision of the Ministry of Agriculture and the Southeastern Anatolia Project (GAP) Regional Development Administration. The survey technique is an effective and preferred tool in data collection (Serper and Aytaç 2000); we collected the study data using structured questionnaires during the interviews in January 2020. Special effort was made to help the respondents understand and answer the questions in the most accurate way. Because research can be defined and perceived as a laborious methodological effort to examine, research, and recreate facts, theories, and practices, there is a need to support quantitative findings by qualitative data in order to reveal the different views and opinions (Johnson and Onwuegbuzie 2004). Therefore, we also used the semi-structured interview method in our data collection.

Data Analysis

Descriptive statistical analysis and the logistic regression method were used for the analysis of the data. The former was used to determine the current status of farmers, as it is thought to identify factors associated with farmers' willingness to continue with the trellis–training system. In econometric studies, limited dependent variable regression models are used when the dependent variable is qualitative. The dependent variable indicating two conditions refers to the presence or absence of an event. It takes the value of 1 if an event occurs, and a value of 0 otherwise. Accordingly, we used logistic regression to predict the possibility of whether the response indicates willingness or unwillingness since the dependent variable in our situation had two consequences or two categories of responses, i.e., willing (1) and unwilling (0) to continue with the wire trellis–training system (Cameron and Trivedi 2010; Adkins and Hill 2011).

The logit model is expressed as follows in Equation 1:

$$P_i = E(Y = 1/X_i) = \frac{1}{1 + e^{-(\beta_0+\beta_1 x_1+\beta_2 x_2+\ldots+\beta_n x_n+e)}} \quad (1)$$

For the ease of illustration, the formula could be expressed as follows in Equation 2 and Equation 3, respectively:

$$P_i = \frac{1}{1 + e^{-Z_i}} \quad (2)$$

$$Z = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_n x_n + e \quad (3)$$

In the formula, P_i denotes the probability of willingness ($Y = 1$) of the ith respondent as $x_1, x_2, x_3, \ldots, x_n$ indicate the explanatory or independent variables and $\beta_1, \beta_2, \beta_3, \ldots, \beta_n$ show slope coefficients for these variables, respectively. Moreover, β_0 denotes the constant term and e represents

Table 1 Explanations of the variables considered in the study

Variables	Explanations
Willingness	Willingness status of the respondents to continue the wire trellis system vineyard (0: unwilling; 1: willing)
Farmer age	Age of the respondent farmers in years
Education	Formal educational status of the respondent farmers (0: No formal schooling; 1: Primary and/or intermediary level; 2: Secondary level and/or more)
Farmer experience	Farmer's farm experience in years
Household size	Number of persons in farm family household
Off-farm income	Annual income obtained from non-agricultural activities
Vineyard acreage	Total vineyard acreage of the respondent farmers in hectares
Social security status	Social security status of the respondent farmers (1: Covered; 0: not covered)
Satisfaction level	Satisfaction status of the respondent farmers with the wire trellis system vineyard (0: little or moderately satisfied; 1: highly satisfied)
Knowledge level	Knowledge level of the respondent farmers on the wire trellis vineyard system (0: less or moderately knowledgeable; 1: highly knowledgeable)
Reason for starting viticulture	The reasons that respondent farmers started grape growing (0: through inherited vineyards; 1: through encouragement of the directorate of agriculture; 2: through seeing from neighbors or somewhere else)

the error term. A complete list of the explanatory variables handled in the logistic regression analysis and their descriptive statistics are presented in Tables 1 and 2, respectively.

In binary logistic regression, the significance of the model is tested with likelihood ratio (LR) tests and the goodness of fit is checked with Pearson X^2 and Hosmer–Lemeshow tests along with pseudo-R^2 values. On the other hand, the validation of the key assumptions of ordinary least squares estimation, such as linearity, normality, and homoscedasticity, is not required in logistic regression based on the maximum likelihood estimation. Thus, we tested the model against the specification error and multicollinearity with linktest and variance inflation factor (VIF), respectively (Cameron and Trivedi 2010; Adkins and Hill 2011).

Linktest and calculated VIF values proved that the estimated logit model was free from specification error and multicollinearity. The VIF values ranged between 1.05 and 2.55 with a mean value of 1.60 (Table 2). Moreover, the Pearson X^2 and Hosmer–Lemeshow tests accept the null hypothesis showing that the regression model fits reasonably well.

Contrary to the classic linear regression models, the slope coefficients in logistic regression cannot be treated as the marginal effect of the independent variables over dependent variable with the *ceteris paribus* assumption. Hence, interpreting the results of regression analysis can be very difficult in such models. For this reason, there is a need to see the effect of the independent variables on the dependent variable in order to interpret the calculated coefficients in such models. To this end, calculus and finite difference methods are used to calculate the marginal efficiency and the result is not changed in either method for continuous variables. However, we used the finite difference method since it gives better results in binary variables (Cameron and Trivedi 2010). Data were analyzed using the Stata 14.0 statistical software (StataCorp, StataCorp LP, Release 14, College Station, TX, USA, 2015).

Results and Discussion

Descriptive Statistics Results

In the study, a total of 79 respondents with vineyards established with the wire trellis systems were evaluated. Their

Table 2 Descriptive statistics for the variables considered in logistic regression analysis

Variables	Observations	Mean	SD	Minimum	Maximum	VIF
Willingness	79	0.62	0.49	0	1	–
Farmer age	79	54.89	11.32	32	85	2.53
Education	79	1.00	0.55	0	2	1.48
Farmer experience	79	32.22	14.24	5	65	2.55
Household size	79	9.27	3.50	1	20	1.45
Off-farm income	79	12,937.72	14,199.03	0	72,000	1.60
Vineyard acreage	79	10.94	5.25	5	30	1.19
Social security status	79	0.58	0.50	0	1	1.37
Satisfaction level	79	0.67	0.47	0	1	1.31
Knowledge level	79	0.70	0.46	0	1	1.47
Reason for starting viticulture	79	0.7	0.6	0	2	1.05
					Mean VIF	1.60

SD standard deviation, *VIF* variance inflation factor

distribution by district was 45 in Dicle, 20 in Hani, eight in Silvan, and six in Kulp district. Because a positive relationship was reported between age and production behavior and the adoption of agricultural innovations (Taluğ 1975; Erem Kaya 2011), the age of the respondents was examined and found to range between 32 and 85, with an average of 54.9 years (Table 2).

It is generally accepted that the economic strength of middle-aged and older farmers and their opportunity to allocate time to agriculture are greater compared with younger farmers. The age distribution of the farmers in this study confirmed this. Investigating the factors affecting the diffusion and adoption of sprinkler irrigation technology in Polatlı, Tatlidil (1989) determined a statistically significant relationship between the age of the farmers and their adoption of agricultural technology.

In the present study, it was found that 54.4% of the respondents were primary school graduates and 10.1% were illiterate, while 15.2% and 11.2% were intermediate and secondary level school graduates, respectively. In previous studies evaluating the level of education and the adoption of innovations in agriculture and participation in agricultural extension activities, it was reported that the higher the education level of the farmers, the higher their demand for agricultural extension activities and the rate of adoption of innovations (Atsan et al. 2009). Yet, Özcan (2004) reported no significant difference between organic farming and conventional farming in terms of the education level of farmers.

Due to the strong historical ties and traditional structures in the agricultural sector, the positive or negative effects of the experiences are quite high. The experience in the agricultural field ensures the self-confidence of the farmers and helps them do their work more easily, quickly, and on time. The average farming experience of the respondents was 32.22 years, ranging between 5 and 65 years of experience. Socioeconomic features of the farmers such as age, educational background, professional experience, and average annual income are important for a successful farm business and sustainable development (Oğuz and Karakuş 2016). Akın (2008) reported that 57.5% of the farmers starting to grow organic strawberry in the Akşehir district of Konya province had more than 20 years of agricultural experience. In the present study, the maximum experience of the respondents with the wire trellis system was 10 years, with an average of 5.8 years (Akın 2008). Considering the wire trellis system support given by the IFAD since 2011, this result is in agreement with previous studies.

It is known that there is a positive relationship between income level and participation in agricultural extension and innovative practices. Thus, Sezgin (2010) reported significantly high attendance rates for high-income farmers in agricultural extension activities. In their study, Ertek et al. (2016) added another point with regard to non-agricultural farm income and reported a parallel and significant relationship between non-agricultural income levels and the cooperative membership status (Ertek et al. 2016).

Proficiency in and Willingness for Wire Trellis–Training System

Land is an indispensable production factor for agricultural activity. It is known that there is a close relationship between the extent of property and the types of production and farmer behavior, since the size of the land has an impact on the sustainable income level and the diversity of the production activities (Bayramoğlu et al. 2014). The scarcity of arable land and the impossibility of increasing the land supply have enhanced the importance of land ownership in agricultural production. In the present study, the farmland included only property of which 1.84 ha and 4.70 ha were irrigated and rainfed, respectively, making a total of 6.54 ha, encompassing 1.1 ha of vineyard on average (Table 3). In a previous study, a positive and significant relationship was reported between the extent of property and innovation testing and adoption (Terin 2015). A significant portion of small family farm businesses in Türkiye have been working in non-agricultural activities to increase the total family income. In our study, 35.4% of the respondents did not have a non-agricultural income, and a significant majority (65.6%) had off-farm income sources. Again, none of the respondent farmers engaged only with viticulture and, as stated above, the acreage of wire trellis vineyards was approximately one sixth of the total farmland. This situation could be interpreted as wire trellis vineyard farming being seen as an alternative farm activity to increase farm production diversity. In semi-structured interviews, respondents declared that viticulture was an alternative production for the existent old, low-yielding traditional vineyards kept only for domestic consumption rather than revenue-generating purposes. In addition, respondents stated that this motivated them to benefit from support and to experiment with innovation.

Even though different authors (Nutley et al. 2002; Clarke 2001; Rogers 2003) have described different stages for the adoption process, it starts with an individual's awareness and ends with his or her adoption or rejection of the

Table 3 Attributes of farmland (ha)

Attributes	Observations	Min	Max	Mean	SD
Rainfed	79	0.0	30.0	4.70	6.00
Irrigated	79	0.0	27.0	1.84	4.25
Total owned farmland	79	0.5	30.0	6.54	6.67
Wire trellis vineyard	79	0.5	3.0	1.10	0.52

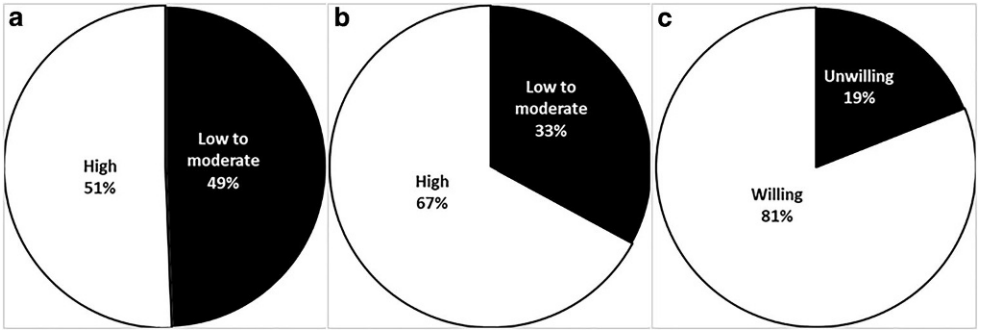

Fig. 2 Opinions and statements of the respondents on their **a** knowledge level, **b** satisfaction status, and **c** willingness to continue the wire trellis system

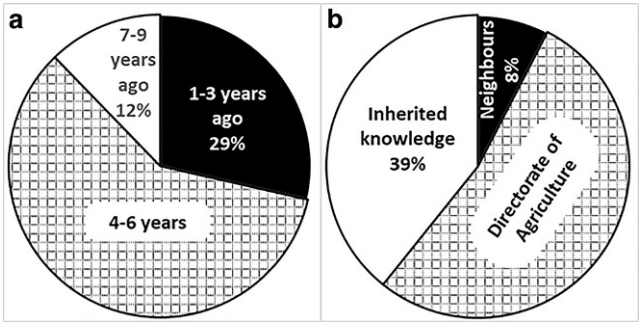

Fig. 3 Respondents' statements on **a** the date of attendance of the courses on wire trellis–training systems, and **b** the method of starting wire trellis–training system

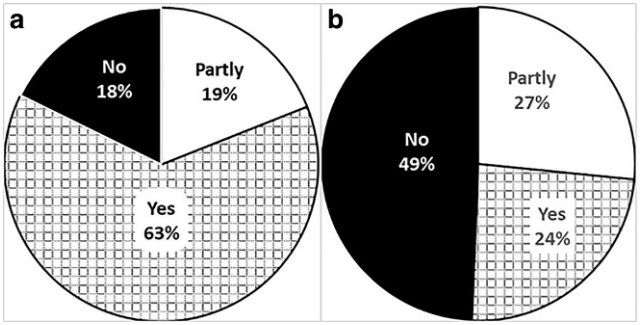

Fig. 4 The effect of **a** IFAD grants and **b** grape prices on starting a wire trellis system

innovation[1]. After awareness stage, individual may be interested in the innovation or not. If interested, they may want to compare it with the existing ones already in use. Then, they may want to proceed with testing or evaluating the innovation at a small scale. At this stage they may also want to compare the innovation with other possible options. If the test stage fails, the innovation is rejected or vice versa. If the test stage results in positive outcomes, the individual will adopt the innovation. However, the possibility of rejection always exists even after adoption (Botha and Atkins 2005).

Agricultural support comprises government interventions with the primary objective of establishing a competitive and self-sufficient sector through the sub-goals of solving the sectoral problems, helping to adopt innovations and new technologies, and increasing production (Yavuz and Dilek 2019). This support plays an important role in the adoption of agricultural innovations, especially at the test or evaluation stage of the adoption decision-making process since farmers, especially small farmers, lack the capital to operate their business (Kara et al. 2004), let alone to afford trying out a new technology. However, support may not be sufficient for farmers to try the new technology without a good knowledge of this technology, even in the case of sufficient capital. Thus, Kiliçtek and Aksoy (2019) reported that knowledge of the innovation had a significant effect on adoption.

When asked about the knowledge levels of the wire trellis system, 50.4%, 34.2%, and 15.2% of the respondents classified themselves as having high, moderate, and low knowledge levels, respectively, which is compatible with the number of people who received training on the subject. Respondents indicated their satisfaction level with the wire trellis system as being high, moderate, and low with rates of 67%, 19%, and 14%, respectively, while the majority (62%) were very willing to continue with the wire trellis system in their vineyards (Fig. 2). The reason for the latter was revealed in the semi-structured interviews to be the high grape yield achieved with the system. Therefore, the farmers would not consider pulling out their vineyards or replacing them with another crop. Inability to market the grapes along with their unsuitability to be processed into other products due to the chosen grape variety, and the off-farm income sources of the respondents, were found to be the reasons for the famers' unwillingness to continue with the wire trellis system.

When asked how they started with wire trellis viticulture, 39.2% of the respondents indicated that they already had inherited knowledge on the vineyards and wanted to make viticulture better, while 53.2% of the respondents pointed out that the directorate of agriculture was the main driver of

[1] Innovation can be described as anything new for an individual, e.g., technology, practice, system, etc., as we accepted the wire trellis system in vineyards in this study as an innovation for the viticulture farmers in Diyarbakır.

their decision. The rest of the respondents (7.6%) reported other reasons such as the neighbor effect (Fig. 3). Upon being reminded in the semi-structured interviews that it was impossible to inherit the wire trellis system since it was new for the region, respondents explained that they inherited the viticulture farming not the system, and that they wanted to continue viticulture with a high-profit system.

Again, 17.7%, 19.0%, and 63.3% of the respondents declared that the support had not been effective, had been partly effective, and had been effective in starting the wire trellis system, in order of importance (Fig. 4). In semi-structured interviews, a majority of the respondents (75%) admitted that the support was very motivating to start the wire trellis system due to the very high establishment costs. They also stated that without support, they would not take the financial risk to try such an innovation. After all these comments, it was concluded that the support made it possible to try the wire trellis system.

The testability of an innovation was already described to be one of the five features that affects the adoption of an innovation (Rogers 2003). It was determined that the efficiency of the Provincial Directorate of Agriculture is very high (94.9%) in the respondents' awareness of the support for a wire trellis system (Table 3), which is in agreement with the findings reported by Erdal et al. (2013). All the respondents also benefited from the government support paid for certified sapling use in addition to the support provided by the IFAD.

It was inferred from the semi-structured interviews that the respondents were unaware of the actual source of the grants, rather they felt responsibility toward the institution that made them benefit from the grants (i.e., Directorate of Agriculture).

Regression Analysis Results

The IFAD support was paid to make farmers to adopt the wire trellis system as an innovation in viticulture farming. As stated earlier, the majority of the respondents (62%) were very willing to continue using the wire trellis system in their vineyards (Table 3), which can be regarded as the adoption of this system by the respondent farmers.

Therefore, the factors affecting the willingness to continue the wire trellis system, namely, the adoption of this innovation, were accepted as proxies for the factors determining the achievement of the agricultural support. Thus, logistic regression analysis was performed by taking the willingness of the respondents to continue with the wire trellis system as the dependent variable with 12 independent, explanatory variables (Table 2). In addition, the marginal (partial) effect was also calculated to determine the effect of independent variables on the dependent variable. Of all variables considered in the logit model, only education, off-farm income, knowledge level, and satisfaction level had significant effects on the willingness to continue with wire trellis systems.

Logistic regression analysis revealed that age did not have an effect on their willingness to continue with the wire trellis system, despite the positive signed coefficient. However, the probability of the respondents' willingness increased with the higher education level of farmers. Thus, a shift from the reference uneducated to primary and/or intermediary level education (up to 8 years) increased the probability, but it was not proved statistically. But compared to the farmers with no formal schooling, those with a degree of secondary level or higher education were 43% statistically significantly ($p < 0.01$) more willing to continue

Table 4 Logistic regression analysis results for the willingness to continue with the wire trellis system

Explanatory variables	Coefficient	SE	*z*	*p*	Marginal effect (dy/dx)
Farmer age	0.0323	0.0646	0.50	0.617	0.0035
Education					
Primary and intermediary	1.4614	0.9972	1.47	0.143	0.1687
Secondary or more	***4.9698***	***2.2792***	***2.18***	***0.029***	***0.4334***
Farmer experience	0.0121	0.0466	0.26	0.795	0.0013
Household size	–0.0220	0.1242	–0.18	0.859	–0.0024
Off-farm income	***–0.0001***	***0.0000***	***–1.86***	***0.064***	***–7.6106***
Vineyard acreage	0.0320	0.0869	0.37	0.713	0.0035
Social security status	–0.3702	0.8272	–0.45	0.654	–0.0405
Satisfaction level	***3.1061***	***0.8908***	***3.49***	***0.000***	***0.3397***
Knowledge level	***2.5151***	***0.9843***	***2.56***	***0.011***	***0.3472***
Reason for starting viticulture					
Directorate of agriculture	*0.2227*	*0.7955*	*0.28*	*0.779*	*0.0253*
Seeing from neighbors	*–1.4700*	*1.4772*	*–1.00*	*0.320*	*–0.1874*
Constant	–5.989415	3.342289	–1.79	0.073	–

Number of observations: 79, *p*: 0.0000, Log likelihood: –27.618, LR chi-square: 49.67, Pseudo-R^2: 47.3500
LR likelihood ratio, *SE* standard error

with the wire trellis system (Table 4). Yet, an insignificant effect of education was reported by Özcan (2004) for the farmers participating in organic and conventional farming in the Kelkit district of Gümüşhane province.

It is well known that the source of income is as important as the income level of the farmers in the adoption and diffusion of modern agricultural technologies in rural areas. In the present study, it was revealed that the effect of off-farm income had a negative and statistically significant ($p < 0.05$) effect on the willingness to continue with the wire trellis system. In other words, every 10 thousand Turkish lira of annual off-farm income reduced the possibility of continuing with the wire trellis system by more than 7% (Table 4). Therefore, we could say that the existence of off-farm income possibilities has a negative effect on the effectiveness of the support in the adoption of the wire trellis system as an innovation.

In their study, Boyaci and Karaturhan (2003) emphasized the benefits of detailed introductory explanations for farmers to obtain a higher level of perceived benefit. In line with this, we believe that knowledge is one of the priority requirements for the adoption and diffusion of the wire trellis system as a new production technique for the vineyard farmers in the study area. Logistic regression results proved this hypothesis, revealing that the effect of the knowledge level on the willingness of farmers for the wire trellis system was positive and significant ($p < 0.01$). It was shown that the respondent farmers who qualified themselves as highly knowledgeable on viticulture were 27% more willing to continue with the wire trellis system, ceteris paribus.

Özkan et al. (2002) did not report a significant effect of experience in their study investigating the factors affecting farmers' behavior in the adoption of innovations. Also, Esengün and Sivaslıgil (1993) reported a similar finding from their study conducted to determine the effective factors in the adoption of innovations.

Similarly, it was determined that farmer experience had a positive but not significant effect on the willingness of farmers to keep the wire trellis system ($p > 0.1$). This could be explained by the inhibitory effect of production habits that make respondents reluctant to adopt the wire trellis system, keeping in mind that production habits may affect farmer behavior and that viticulture is a traditional production activity for the farmers in the study area and not an innovation; however, the wire training system is an innovation for the farmers.

The knowledge level of the respondents regarding the wire trellis system had a significant effect on willingness ($p < 0.05$). In the semi-structured interviews, the respondents explained that their existing vineyard knowledge and viticulture experiences were effective in the positive decision in favor of the wire trellis system during the introductory courses and they decided to benefit from the support after the positive comparison between the new and the existing traditional grape vine training systems.

The satisfaction status of the respondents also had a very significant and positive effect ($p < 0.01$) on their willingness to keep the wire trellis system. It is evident from the results shown in Table 4 that respondent farmers who identified themselves as highly knowledgeable and those with high satisfaction level were approximately 35% and 34%, respectively, more willing to continue with the new system (Table 4). We elicited from the semi-structured interviews that respondents were happy with the support by which they managed to replace the old, unproductive vineyards with new ones, ensuring an increase in production, which enhanced the likelihood of future generations continuing with viticulture.

Conclusion

In general, support policies are followed to direct the agricultural production and to encourage sustainability and product diversity using the scarce resources more effectively. This was achieved, as previous studies reported positive, long-term causal relationships between agricultural support payments and agricultural production in Türkiye (Yıldız 2017; Arslan 2017; Direk et al. 2019; Sağdıç and Çakmak 2021).

The IFAD support granted to the wire trellis system met several objectives of the support policies such as adoption of a new production technique by viticulture farmers, sustainability of grape production, and ensuring the product variety. Therefore, willingness to going ahead with the wire trellis system was accepted as the indicator of the achievement of the objectives of the IFAD support. In the present study, the high percentage of the willingness (62%) to continue with the wire trellis system meant a high percentage of achievement of the support goals.

Although all the study farms are small-scale enterprises, the fact that the farmland was composed of both rainfed and irrigated lands and that viticulture was an auxiliary production activity in these farms made it possible to evaluate the wire trellis system at the evaluation stage of the adoption process. In another word, this IFAD grant supported an auxiliary income-generating activity and farmers did not show resistance since it did not incur great risks for the farm income. In addition, farmers approached the IFAD grants positively since they could not afford the high establishment costs of the wire trellis system in an auxiliary branch of production performed as a tradition. In brief, the subject or the crop to be supported and its share in the total farm income are effective in the evaluation and adoption of an innovation.

Another salient finding of the study indicated that off-farm income only marginally ($p<0.07$) and negatively affected the willingness of the farmers to continue with the wire trellis system. This could be explained by the fact that those having off-farm income saw agricultural activity as a secondary, auxiliary, or supplemental source of income and would not like to spend their time and workforce in it, especially when their expectations regarding generated income were not fulfilled.

Consequently, in order to gain the expected outcomes from the support policies, we should admit that it is beneficial to pay attention to supporting the young (under a specific age, e.g., 40) and educated (at least secondary level of formal education) farmers whose primary source of income is agriculture. In this context, it is also beneficial to accompany the support with a relevant and continuous training and extension work in earnest to achieve the intended objectives. In reaching this goal, the type, amount, and time of the support should be planned better based on the data of the socioeconomic and demographic characteristics of the target farms and the farmers from previous diagnostic studies.

Achieving the goal of the support is a multivariate complex process varying from individual to individual. It is related to the purpose of the support on the one hand, while also being related to the individuals and the context in which the innovation is used, on the other hand. We also infer that the effectiveness of the support policies is closely related to the elimination of structural problems. With a support policy adjusted to the target group, enhanced farm income and increased competitiveness objectives in agriculture could be achieved.

Different tools can be utilized especially for the small-scale farms that cannot benefit from the support. In this way, the possibility of keeping them in the agricultural sector could be improved by means of their enhanced living standards. Large-scale farms benefit more from the support due to the policies shaped in line with their needs; small-scale farms, however, can manage to use their scarce resources more efficiently with the support that is targeted at themselves. With support, the negative effects of cost pressure on small-scale farms can be alleviated and they can be made more competitive. Of course, all of these measures will bring about the progress in achieving the country's strategic agricultural goals.

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Conflict of interest S. Akın and A. Kara declare that they have no competing interests.

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