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# Uptake of agri-environmental schemes in the Less-Favoured Areas of Greece: The role of corruption and farmers' responses to the financial crisis

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## **Keywords:**

Viticulture

Farming systems

Rural development

Selection bias

Ordered probit

## **abstract**

Vine-growing in the Less-Favoured Areas of Greece is facing multiple challenges that might lead to its abandonment. In an attempt to maintain rural populations, Rural Development Schemes have been created that offer the opportunity to rural households to maintain or expand their farming businesses including vine-growing. This paper stems from a study that used data from a cross-sectional survey of 204 farmers to investigate how farming systems and farmers' perception of corruption, amongst other socio-economic factors, affected their decisions to continue vine-growing through participation in Rural Development Schemes, in three remote Less-Favoured Areas of Greece. The Theory of Planned Behaviour was used to frame the research problem with the assumption being that an individual's intention to participate in a Scheme is based on their prior beliefs about it. Data from the survey were reduced and simplified by the use of non-linear principal component analysis. The ensuing variables were used in selectivity corrected ordered probit models to reveal farmers' attitudes towards viticulture and rural development. It was found that economic factors, perceived corruption and farmers' attitudes were significant determinants on whether to participate in the Schemes. The research findings highlight the important role of perceived corruption and the need for policies that facilitate farmers' access to decision making centres.

## **1. Introduction**

In Greece, 83% of agricultural land is in Less-Favoured Areas (LFA) where 29% of the population lives. Agriculture in LFA is the main activity consisting of extensive systems of olive and vine growing (Hellenic Ministry of Agricultural Development and Food, 2007).

Viticulture has contributed to the cultural and economic life of these areas creating landscapes of great aesthetic value. However, during the last 15 years, viticulture is being abandoned, as farmers take up other employment. The consequences of abandonment include a reduction of grape supply to the wine-making industry and important impacts on the social and economic structures of the LFA. Amongst the main threats to viticulture land use in LFA are low productivity and tourism infrastructure (Tzanopoulos et al., 2011; Kizos et al., 2009) along with low grape prices, high labour demands and seasonality of employment demand (Papadopoulos and Papanikos, 2005).

However, in recent years, traditional vine-growing has gained importance again as a change in lifestyle of the urban population has created a revived demand for traditional landscapes and ways of life (Fleskens et al., 2009). Also, as a result of the global economic crisis, Greek households are facing economic challenges, leading residents of LFA to return to farming and vine-growing (Kassimis and Papadopoulos, 2013).

In an attempt to maintain the rural population, the EU's Rural Development Policy was designed to provide opportunities to farmers in LFA. These opportunities include the promotion of multifunctional activities. The EU Rural Development Policy was implemented in Greece by the Rural Development Program for Greece, 2007–2013. Three schemes were included in this program for the vine-growing sector: an investment aid scheme that compensates up to 80% of an investment made to improve farm infrastructure; a subsidy for the adoption of organic practices compensating growers for income losses from being organic; and a subsidy scheme for investment in agro-tourist activities, paying up to 80% of

investment made on non-farming activities on farm. These schemes were on a voluntary basis and subject to the rules of eligibility of the Rural Development Programme for Greece. These measures were seen as crucial for the sector, but the adoption rate has not been as high as expected by policy makers (Karanikolas and Martinos, 2007). An investigation into the first two of these schemes is reported here.

Previous studies on the Greek agricultural sector have revealed that one of the country's major problems is associated with institutional structure including corruption. Specifically for agriculture, in any transaction with the authorities, farmers' ability to approach and influence the institutional system could be difficult due to institutional corruption. Institutional corruption in Greece is a complex social issue, which is led by financial motives and processed through social interactions between farmers and authorities and the interference of agencies and informal political networks (Louloudis et al., 2000; Vounouki, 2004; Karanikolas and Martinos, 2007; Barrio and Vounouki, 2003). Implementation of agricultural policies is perceived by the public as subject to corruption and political interests and dependent on fragmented, clientelist and uneven social protection which is often facilitated by the complicated legislative framework (Kourliouros et al., 2006; Karanikolas and Hatzipanteli, 2010; Monastiriotes and Antoniadis, 2009).

The economic recession caused by the ongoing Greek Government's debt crisis has had great financial and social consequences at both the individual and sectorial levels, including the agricultural and rural sector. The resultant austerity measures have led to reduced farm incomes and product prices and reduced access to credit. The budget for funding rural development has also been reduced and farmers are less willing to take investment risks (Hellenic Ministry of Agricultural Development and Food, 2012).

The success of multifunctional agricultural schemes depends on farmers participating in them. Most research on farmers' willingness to participate in multifunctional schemes in Europe has focused on agri-environmental schemes. Four different approaches emerge from such literature: the financial approach where farmers' decisions are based on profit maximization (Sintori et al., 2009; Genious et al., 2006; Bougherara and Latruffe, 2010); the spatial approach that examines farmers' intentions from a geographical view (Wilson, 2009; Lange et al., 2013); the social demographic approach where decision making is based on demographic and structural characteristics of the farms and on the nature of the measure to be adopted (Tore, 2003; Mathijs, 2003; Broch et al., 2012; Vanslebrouck et al., 2002); and the behavioural approach that investigates farmers' behaviour, views and attitudes on key aspects associated with agri-environmental schemes (Blackstock et al., 2010; Burton et al., 2008; Rehman et al., 2007; Emery and Franks, 2012; Ingram et al., 2013). Some previous behavioural studies have also combined psychological aspects and farm characteristics when investigating farmers' decision making at the individual level (Mattison and Norris, 2007; Laple and Kelley, 2013; Gorton et al., 2008; de Lauwere et al., 2011; Areal et al., 2012; Hansson et al., 2012; de Graaff et al., 2010).

In Greece, Papadopoulos and Papanikos (2005) examined the labour allocation preferences of vine-growing households on a Greek island and Oxouzi (2008) investigated the adoption of organic viticulture in Central Macedonia with the focus being on economic and demographic factors, and not on farmer's attitudes and behaviours.

Here, we use an integrated approach that combines socio-economic, geographical, agricultural and psychological aspects to investigate farmers' intention to participate in two multifunctional schemes, an investment aid scheme and a subsidy scheme for the adoption of organic practices, as well as a set of potential drivers behind farmers' intention. We incorporate three novel aspects, farmers' perception of institutional corruption, farmers' perception of economic recession, and farming systems into our analysis of intention to participate in the schemes. Perception of corruption is a factor that has not been incorporated before in behavioural studies of farmers. Similarly, perception of the ongoing economic recession is used here for the first time. Although farm structural characteristics are often incorporated in this type of analysis, we focused on identifying specific vine-growing systems to both examine their influence on farmers' willingness to participate in agricultural schemes and use them as control variables. Farming systems within LFA are quite diverse and depend on factors such as tradition, terrain and resources available and the purpose of the vineyard. We classified farms based on their

characteristics, purposes, structure, intensity and farm household characteristics. Our analysis enables us to discuss policy tools that could increase vine-growers' participation in these schemes making them more efficient.

This paper is organized as follows. First, the methodology used is explained, including a description of the data collection method and an explanation of the econometric analysis of farmers' willingness to participate in the two schemes. Then, the results of the analyses are presented and discussed. Finally, some conclusions are made.

## **2. Methodology**

### *2.1. Conceptual framework*

We use the framework of the Theory of Planned Behaviour (TPB), developed by Ajzen (1991) to help explain human behaviour as a "starting point" to frame the problem. Thus, an individual's intention to participate in a scheme is based on the farmer's prior beliefs about the scheme. An individual's overall belief comprise behavioural, normative and control beliefs. In this context: behavioural beliefs are an individual's personal beliefs about the consequences of participating in the agricultural scheme; normative beliefs are an individual's perception of social pressure to participate or not in the scheme; whereas control beliefs refer to the individual's perceived ease or difficulty of participating in the scheme. A number of statements on potential farmers' views about the scheme were evaluated by farmers and grouped into a number of components using non-linear PCA. This enabled us to use these new constructs in the analysis of farmers' intention to participate in the schemes.

Since we were interested in investigating how specific factors, such as farmers' perception of institutional corruption, farmers' perception of the economic crisis as well as farmers' views about the future and local characteristics of the environment in which the farm is located (i.e. the agricultural system of the farm) may affect farmers' intention to participate in the schemes, we incorporated them along with socio-demographic aspects and farmers' experience of participating in similar schemes into our conceptual framework (Fig. 1).

### *2.2. Survey*

Three Greek areas with substantial vine-growing activity were selected for study: the mountain area of Ioannina; the island of Samos; and the coastal area of Kavala. They represent three types of LFA in Greece – mountains, islands and areas with special handicaps, as designated in EU Regulation (EC) 1698/2005.

The survey of vine-growers took place between July and September 2012. A total of 204, randomly chosen, vine-growers participated. The survey used an anonymous questionnaire. The questionnaire design was partially based on information obtained from a series of in-depth interviews with 18 farmers and an agronomist that took place prior to the survey.

The questionnaire was divided into three sections. First, questions on demographic and farm characteristics aimed at collecting information for the identification and classification of vine-growing systems. The second section collected information on farmers' intention to continue vine-growing and to participate in the two schemes or not. In the third section, participants were asked to evaluate on a 5-step scale a number of statements designed to reveal their perception of the schemes and their attitudes towards them. More specifically, farmers evaluated:

- 1) views and attitudes towards vine-growing and the two schemes;
- 2) perception of corruption in the vine-growing sector; and
- 3) perception of the impact of the economic recession on their farming activities.

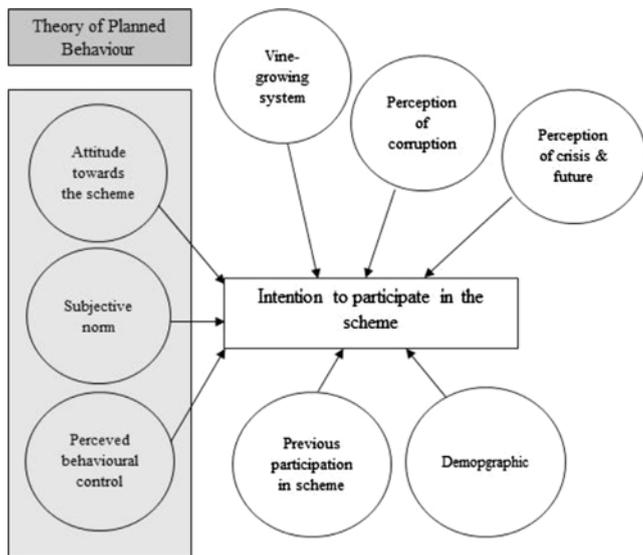


Fig. 1. Conceptual framework.

**Table 1**  
Description of farm types based on the results of non-linear PCA.

Farm type	Description
Island vineyards	Traditional vineyards on terraces dependent on co-operatives combined with olive trees, existing because of tradition. Minimum mechanization, no irrigation and low cup formation system. Island areas
Mountain vineyards	Hill-side farms combined with livestock, full-time farming, existing because of lack of employment opportunities. Mechanized. Mountain areas
Coastal vineyards	Intensive commercial farms of table grapes dependent on contractors, combined with perennial crops, existing for income generation. Highly mechanized, irrigated, and sustained table grape formation system. Coastal areas
Part-time vineyards	Intensive mechanized vineyards dependent on wineries, part-time farming, double linear formations system. All areas
Estate vineyards	Large fragmented vineyards, part of wine-making estates. Lifestyle as reason for existence. Mountains and coasts
Hobby vineyards	Household vineyards combined with other household farming activities. No defined purpose or reason for existence. All areas

The statements on farmers' views and attitudes were based on information derived from the qualitative analysis of the interviews and were designed to capture the three dimensions in the TPB (personal beliefs, subjective norms and perceived behavioural control). Specific statements were made for each agricultural scheme based on the information obtained from the in-depth interviews.

Thus, for the investment aid scheme, participants had to evaluate 17 statements regarding personal beliefs, 5 statements regarding subjective norms and 8 statements regarding perceived behavioural control. For the organic vine-growing scheme, participants had to evaluate 14 statements on personal beliefs, 5 statements on subjective norms and 8 statements on perceived behavioural control. The statements used for both schemes and their relation to each of the TPB factors are presented in Appendix A Tables A.1 and A.2.

### 2.3. Statistical analysis

Information from the survey was simplified using non-linear principal component analysis (PCA), a data reduction methodology that functions in the same way as factor analysis, but can incorporate categorical variables by transforming them into numeric ones (Linting et al., 2007). The outcome of a non-linear PCA, is a reduced number of variables (or principal components) that are correlated with the original dataset but uncorrelated to each other. The main difference between traditional PCA and non-linear PCA is that the results of the latter are not nested, meaning that the eigen-values change as the number of components in the analysis change (Linting et al., 2007). Therefore, the criterion followed to select the number of components was the Cronbach's alpha coefficient criterion which measures the degree to which a set of observations measure a component and can be used to describe the reliability of factors extracted (Manisera et al., 2010; Gliem and Gliem, 2003). A threshold of coefficient value being 0.5 was chosen. The components that had a Cronbach's  $\alpha > 0.5$ , also had an eigen-value greater than 2. The eigen-value  $> 2$  was used as an extension of the Kaiser (1958) criterion for selecting underlying components to confirm the validity of the choice of number of components (Jongeneel et al., 2008).

Three non-linear PCA were conducted on: the variables describing the vine-growing systems; the evaluation of behavioural statements reflecting farmers' views and attitudes towards the investment aid scheme; and the evaluation of behavioural statements reflecting farmers' views and attitudes toward the organic vine-growing scheme.

For identification of vine-growing systems a non-linear PCA was performed on variables related to vineyard and farm management characteristics, derived from the first section of the questionnaire. This enabled the identification of 6 vine-growing systems (Table 1). (The results of the PCA and the factor loadings are presented in Appendix B Table B.1.) The non-linear PCA performed on behavioural statements related to participating in the investment aid scheme yielded three factors: financial; idealism; and perceived behavioural control (Table 2). The non-linear PCA performed on farmers' views and attitudes towards the organic vine-growing subsidy scheme also produced three factors (Table 3). The results of the PCA were used as numerical variables in the estimation models. For ease of interpretation, they were normalized on a scale from 0 to 10 (Areal et al., 2012).

As shown in Table 2, the first factor (Financial\_imp) reflects personal attitudes to economic issues and describes farmers that are interested in the financial aspect of receiving a subsidy for investing in their vineyards. It also includes statements relating to peer pressure for having a good vineyard to the perceived social views on receiving a subsidy. The second factor (Idealists\_imp) is about personal attitudes relating to the value of the environment and landscape and to the development of viticulture and it describes farmers that are more interested in the importance of their vineyards for issues other than profit making. It includes one statement relating to social interaction. The third factor (Control\_imp) relates to perceived behavioural control and describes farmers that find it easy to apply for a subsidy, collaborate with the authorities and understand the relevant procedures.

As shown in Table 3, the first factor (Financial\_org), again, describes economic related personal attitudes and describes farmers that are concerned with the profit-cost relationship emerging from receiving a subsidy for being organic. It, too, also includes the statements relating to social pressure for having a good vineyard and to the social views on receiving a subsidy. The second factor (Idealists\_org) describes farmers that are interested in the importance of organic farming on non-profit aspects like environmental protection and the development of viticulture and the area and also have interests outside farming. This factor includes statements on social norm that describe the interaction of farmers with each other and society. Similarly to the previous scheme, the third factor (Control\_org) relates to perceived behavioural control and describes farmers that have no difficulties collaborating with the authorities and applying for a subsidy.

The incorporation of the results of the non-linear PCA analyses results in the conceptual framework of the study being adapted as presented in Fig. 2.

A variable on perception of corruption was generated by asking participants to evaluate, on a 5-step Likert scale, the level of corruption in the bureaucratic procedures for each scheme (with 1 = very low and 5 = very high). Farmers perceiving high/low levels of corruption within the bureaucratic procedures were expected to have a negative/positive effect on willingness to participate in the schemes.

Two additional variables accounting for farmers' perception of the economic recession were also included. The first described farmers' perception of the impact of the recession on their activities and they were asked to evaluate the impact of the recession on the viticulture sector. The second was associated with the belief that the situation of the vine-growing sector will improve in the future and was generated by asking the farmers their agreement or not to this statement. We expected that farmers who were optimistic about the future would be more willing to participate in either of the study schemes than would those who were pessimistic.

A dummy variable on previous participation in each study scheme was also included as it was expected that vine-growers who had experience in participating in schemes would be more likely to participate again than vine-growers without such experience. Finally, farmers' education level and age were used as demographic variables.

#### 2.4. Estimation

Examination of factors influencing farmers' willingness to participate in the schemes studied was based on Random Utility Theory, i.e. vine-growers would choose to participate in a scheme if this

Behavioural factors related to the Investment Aid Scheme.

Factor			Component loadings	
Financial imp	There are delays in payments of the investment aid	ATT <sup>a</sup>	0.659	
	Others expect me to have the best vineyard	NORM <sup>a</sup>	0.650	
	People think that I should not receive subsidies	NORM	-0.638	
	It is important to receive a subsidy	ATT	0.619	
	It is profitable to modernize the vine-growing system	ATT	0.523	
	Vineyard improvement helps reduce production costs	ATT	0.457	
	People consider farmers to be socially lower	NORM	-0.592	
	It is important to maintain my vineyard	ATT	0.376	
Idealists imp	Improving the vineyard improves product quality	ATT		0.872
	It is important to protect the environment	ATT		0.833
	It is important to maintain landscape	ATT		0.791
	Rural landscapes have aesthetic value	ATT		0.790
	Cost of investment for vine-yard improvement is high	ATT		0.761
	It is important to expand my business	ATT		0.693
	My relation with the other farmers is good	NORM		0.649
	Subsidies are useful to farmers	ATT		0.544
	My vineyard is not eligible for improvement	ATT		0.506
	Subsidies help viticulture develop	ATT		0.455
	Subsidies are useful to area	ATT		0.444
	It is useful to improve my vineyard	ATT		0.352
ControlImp	It is easy to have the necessary connections to receive a subsidy	CONT		0.717
	It is easy to apply for the Investment Aid Scheme	CONT <sup>a</sup>		0.659
	Subsidies involve long procedures	CONT		-0.655
	It is easy to collaborate with authorities	CONT		0.625
	It is easy to improve my vineyard	CONT		0.623
	It is important to expand vineyard	ATT		0.586
	It is easy to understand the law	CONT		0.581
	My subsidies are subject to other people's decisions	NORM		-0.553
There is a lot of red tape in RD scheme participation	CONT		-0.507	

<sup>a</sup> ATT = attitude, NORM = subjective norm, CONT = perceived behavioural control.

**Table 3**

Behavioural factors related to the organic vine-growing scheme.

Factor			Component loadings	
Financial.org	Organic farming lowers yield	ATT <sup>a</sup>	0.809	
	Organic farming lowers quality standards	ATT	0.777	
	Organic Farming Schemes has strict rules	ATT	0.707	
	Others expect me to have the best vineyard	NORM <sup>a</sup>	0.579	
	Organic products have higher prices	ATT	0.555	
	People think that I should not receive subsidies	NORM	-0.549	
	It is important to receive a subsidy	ATT	0.516	
	Supplies for organic farming are costly	ATT	0.447	
	It is useful to be organic	ATT	-0.376	
Idealists org	Organic products have better quality	ATT		0.728
	Subsidies are useful to farmers	ATT		0.671
	My relation with the other farmers is good	NORM		0.654
	I am interested in environmental protection	ATT		0.647
	People consider farmers to be socially lower	NORM		-0.579
	Subsidies help viticulture develop	ATT		0.568
	Subsidies are useful to area	ATT		0.565
	It is important to have interests outside farming	ATT		0.491
It is easy to stay in the area	CONT <sup>a</sup>		0.405	
Control.org	It is easy to apply for the Organic Farming Scheme	CONT		0.740
	Easy to have the necessary connections to receive a subsidy	CONT		0.722
	Subsidies involve long procedures	CONT		-0.687
	My subsidies are subject to other people's decisions	NORM		-0.661
	It is easy to collaborate with authorities	CONT		0.642
	It is easy to understand the law	CONT		0.592
	It is important to secure my income	CONT		0.491
	There is a lot of red tape in RD scheme participation	CONT		-0.417
	It is easy to be organic	CONT		0.383

<sup>a</sup> ATT = attitude, NORM = subjective norm, CONT = perceived behavioural control.

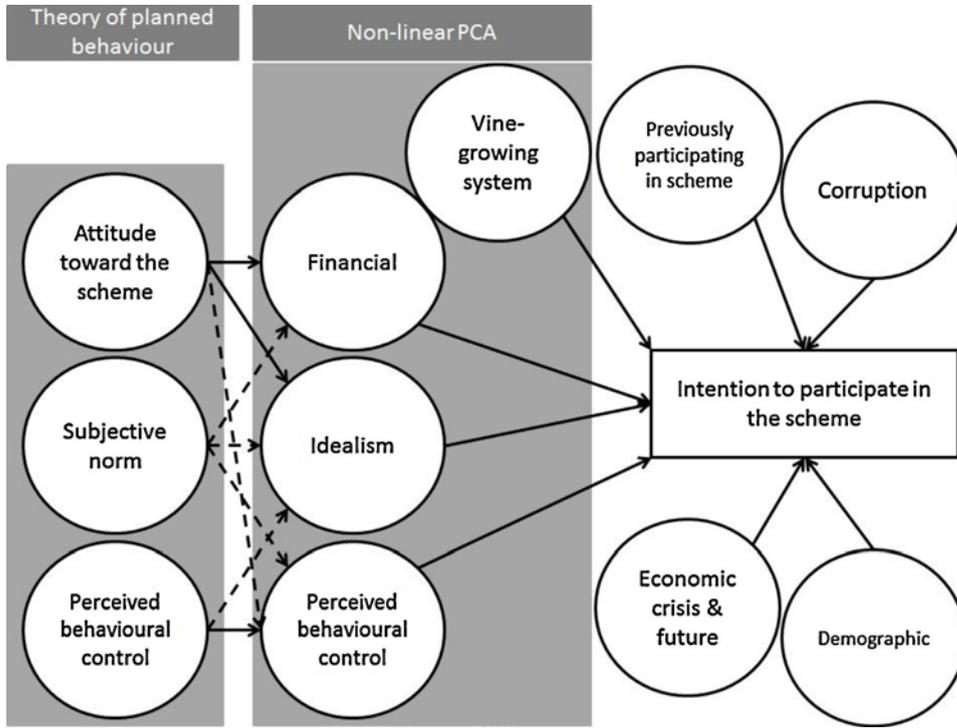


Fig. 2. Incorporation of variables in the study conceptual framework.

choice maximized their utility. Utility can be expressed as a latent variable  $y_i^*$ :  $y_i^* = x_i' \beta + e_i, i = 1, 2, \dots, N$

(1) where  $i$  is the number of each observation;  $x_i'$  is the vector of the factors influencing  $y_i^*$ ;  $\beta$  is a vector of coefficients to be estimated; and  $e_i$  is disturbances that are unobserved with  $e_i \sim N[0,1]$  (Greene, 2004). However, according to Greene and Hensher (2010), adoption of an innovation is not a completely random process as farmers self-select themselves into treatment. Therefore, before examining their willingness to participate in a scheme, participants were first selected according to their willingness to continue vine-growing and only likely continuers were assessed for their willingness to participate in the schemes. In order to account for this, a selection utility equation was added to the model of Eq. (1), so that it takes the following form:

$$\begin{cases} y_{i1}^* = x_{i1}' \beta_1 + e_{i1}, \\ y_{i2}^* = x_{i2}' \beta_2 + e_{i2}, \end{cases}$$

where  $e_{ij}$  are the normally distributed error terms,  $\beta_1$  is a vector of parameters to be estimated in the model of the first equation,  $\beta_2$  is a vector of parameters to be estimated in the model of the second equation, with

$$E[e_{i1}|x_{i1}, x_{i2}] = E[e_{i2}|x_{i1}, x_{i2}] = 0, \text{Var}[e_{i1}|x_{i1}, x_{i2}] = \text{Var}[e_{i2}|x_{i1}, x_{i2}] = 1 \text{ and } \text{Cov}[e_{i1}, e_{i2}|x_{i1}, x_{i2}] = \rho.$$

For this model the conditional probability is:

$$\text{Prob} [y_{i1}^* = 1 | y_{i2}^* = 1] = \frac{\Phi(x_{i1}' \beta_1, x_{i2}' \beta_2, \rho)}{\Phi(x_{i2}' \beta_2)}$$

Given the fact that intentions of vine growers to continue has a binary response (yes or no)<sup>1</sup> and the willingness of a vine-grower

<sup>1</sup> More details on the variables and the results of the sample selection model can be found in the Appendix.2 All explanatory variables used in all models were checked for statistical significance through  $\chi^2$  tests for discrete variables and a one sample  $t$ - test for continuous ones. Also, to account for multicollinearity, correlation matrices for all explanatory variables and V.I.F. indexes of all variables were checked.

Descriptive statistics of variables used in the estimation models.

Variable	Description	Mean	Std. dev.
Variables common for both modes			
Island vineyards	PCA result (scale 1-10)	5.464	2.007
Mountain vineyards	PCA result (scale 1-10)	3.929	1.922
Coastal vineyards	PCA result (scale 1-10)	2.561	1.897
Part-time vineyards	PCA result (scale 1-10)	3.458	1.841
Estate vineyards	PCA result (scale 1-10)	2.433	1.720
Hobby vineyards	PCA result (scale 1-10)	3.957	1.967
Age	Age in years	49.09	13.764
Education	Dummy (1 = college or university, 0 = otherwise)	0.37	0.485
S future	Dummy (1 = positive, 0 = negative)	0.36	0.482
Recession	Dummy (1 = negative, 0 = positive)	0.84	0.369
Variables used in the ordered probit on willingness to participate in the investment aid Scheme			
Corruption	Dummy (1 = farmers believes there is corruption, 0 = otherwise)	0.480	0.501
Previous participation imp	Dummy (1 = yes, 0 = no)	0.340	0.474
Financial imp	PCA result (scale 1-10)	7.472	1.620
Idealists imp	PCA result (scale 1-10)	4.740	2.683
Control imp	PCA result (scale 1-10)	4.418	2.145
Variables used in the ordered probit on willingness to participate in the organic farming scheme			
Previous participation org	Dummy (1 = yes, 0 = no)	0.16	0.365
Corruption1	Dummy (1 = farmers believes there is corruption, 0 = otherwise)	0.38	0.486
Financial org	PCA result (scale 1-10)	4.611	1.976
Idealists org	PCA result (scale 1-10)	6.793	1.942
Control org	PCA result (scale 1-10)	4.493	1.810

to participate in a scheme was rated on a 5-point Likert scale and, under the assumption that the error terms are normally distributed, we can say that a standard probit model dominates the first equation and an ordered probit model dominates the second.

A two-step conditional model was developed following Greene and Hensher (2010), where the observed outcomes  $y_{ij}$  are related to  $y_{i1}^*$  as follows:

$$\begin{cases} y_{i1}^* = 1 \text{ if } y_{i1}^* > 0, y_{i1} = 0, \text{ otherwise} \\ y_{i2} = J \text{ if } \mu_{j-1} < y_{i2}^* \end{cases}, 1 \leq j \leq 5$$

where  $y_{i1}$  is the observed outcome of the selection model (i.e. stated willingness to continue vine-growing by farmer  $i$ );  $y_{i2}$  is the observed outcome of the second model (i.e. stated intention to participate in the scheme by farmer  $i$ ); and  $\mu_j$  are unknown threshold parameters to be estimated with  $0 < \mu_1 < \mu_2 < \dots < \mu_j$ .

The primary aim of the analysis was to obtain consistent estimates of a vector of parameters  $\beta_1$  and  $\beta_2$ , by using observations from the selected sample. Given that both parts of the structured model are non-linear, the maximum likelihood estimation (MLE) is considered the most adequate choice (Luca and Perotti, 2011).

The two equations need to be estimated simultaneously in order to account for sample selection which, in practice, means that for a particular farmer  $i$ ,  $y_{i2}$  is not observed unless  $y_{i1} = 1$ . In MLE, the covariance of the error terms of the two equations  $\rho$  is not directly estimated (Luca and Perotti, 2011), but the transformed correlation coefficient  $\hat{\rho}$ , based on Fisher's  $z$  transformation is estimated instead:

$$\hat{\rho} = z = \text{atanh} \rho = \frac{1}{2} \ln \left( \frac{1 + \rho}{1 - \rho} \right)$$

where,  $z$  is normally distributed,  $\ln$  is the natural logarithm function and  $\text{atanh}$  is the inverse hyperbolic function (Fisher, 1915). This transformation is preferred as for sample correlation it has a near-constant variance for all values of  $\rho$  (Cox, 2008; Buis, 2011).

The effect of the explanatory variable is measured in terms of marginal effect defined as partial change in the probability of the outcome caused by a change in an explanatory variable *ceteris paribus* (marginal effects).

In addition, a standard order probit model, with 5 outcomes, was estimated for each scheme and the results were compared to the selectivity-corrected models.

### 3. Results and discussion

#### 3.1. Descriptive statistics

The statistical analysis was performed using STATA 12 software. Table 4 shows the means of the variables used in the ordered probit models. Some variables were common for all models, while others were model specific.

The mean of the normalized variables on a scale from 1 to 10 shows that, on average, the majority of the participants' vineyards fall under the 'island vineyards' category. Also, for the investment aid scheme, the majority of farmers fall under the factor describing financial concerns (Financial imp). However, for the organic vine-growing scheme, the majority of farmers belong to the category of idealists (Idealists\_org).

Regarding corruption, farmers' perceptions of its existence differs on average between the implementation of the two schemes, with 48% of the farmers believing it exists in the procedures for the investment aid scheme, whereas a smaller percentage (38%) thinks it is present in the implementation of the organic vine-growing scheme. Most participants (84%) found that the recession had had a negative impact on their vine-growing activities.

Estimated willingness to participating in subsidy schemes rates are shown in Table 5. Overall, willingness to participate is higher for the investment aid scheme than for the scheme for organic practices.

**Table 5**  
Rates of willingness to participate in subsidy schemes.

	Willingness to participate in the scheme for organic practices (%)	Willingness to participate in the scheme for investment aid (%)
Very unlikely	35.15	16.08
Unlikely	30.20	18.09
Uncertain	9.90	21.61
Likely	11.39	33.17
Very likely	13.37	11.06

**Table 6**  
Determinants of farmers' willingness to participate in the investment aid scheme.

Explanatory variables	Standard model		Corrected model	
	Coef.	z	Coef.	z
Financial_imp	0.331***	4.34	0.364***	3.96
Idealists_imp	0.036	0.75	0.092	1.54
Control_imp	0.328***	6.11	0.396***	5.99
Recession	0.490 <sup>†</sup>	1.62	0.508	1.60
S_future	0.259	1.40	0.384**	1.83
Corruption_imp	-0.665***	-3.49	-0.707***	-3.08
Previous participation_imp	0.766***	3.37	0.891***	3.85
Island vineyards	0.039	0.74	0.057	0.84
Mountain vineyards	-0.024	-0.45	0.061	0.98
Coastal vineyards	-0.030	-0.54	0.076	1.17
Part-time vineyards	-0.082 <sup>†</sup>	-1.63	-0.083	-1.34
Estate vineyards	0.056	1.01	0.101 <sup>†</sup>	1.64
Hobby vineyards	0.000	0.02	0.035	0.69
Age	-0.010	-1.55	-0.009	-1.19
Education	-0.003	-0.01	0.241	1.02
$\mu_{11}$	2.191		4.041***	3.95
$\mu_{21}$	3.256		5.147***	4.79
$\mu_{31}$	4.259		6.399***	5.60
$\mu_{41}$	6.052		8.244***	6.76
$\hat{\rho}_1$	0.146 <sup>†</sup>	1.84		

<sup>†</sup> Statistically significant at 0.1 level of significance.

\*\* Statistically significant at 0.05 level of significance.

\*\*\* Statistically significant at 0.01 level of significance.

#### 3.2. Estimation results

Two ordered probit models, one for vine-growers' participation in the investment aid scheme and one for vine-growers' participation in the organic farming scheme, were estimated. Each model was estimated with, and without, selectivity correction to identify any self-selection. (The variables used in the selection model and their descriptive statistics are presented in Appendix C, Tables C.1, C.2 and C.3. The estimated coefficients of the selection model are shown in Appendix C, Table C.4). We only found self-selection to be the case for the investment aid scheme. In both models, robust standard errors were estimated to account for potential heteroskedasticity. To assess the fit of the models, Wald statistic tests were carried out.

### 3.2.1. Investment aid scheme

Table 6 shows the results of the models estimating vine-growers' intention to participate in the investment aid scheme. The correlation coefficient  $\hat{p}_1$  between the selection model and the ordered probit was statistically significant meaning that selectivity correction was needed. Therefore, the model chosen for discussion is the selectivity corrected one. The selection equation eliminated 44 observations, so the estimation of the probabilities was for the remaining 160 ones. Table 7 shows the marginal effects of the explanatory variables on each outcome of the model (marginal effects of the non-selectivity corrected model are shown in Appendix D Table D.1). As indicated in Tables 6 and 7, farmers' intention to participate in the investment aid scheme is negatively influenced by their perception of corruption in the scheme's bureaucratic procedures. Thus, a one unit increase in farmers' perception of corruption on a 1–10 scale would lead to a 14% drop in their responding positively to participate in the scheme. Discussions with farmers led to the observation that corruption can be a serious issue when it comes to participating in the investment aid scheme and that the subsidy received from the scheme does not always compensate for the effort and the money needed to overcome corruption. Karanikolas and Martinos (2007) found that farmers believe there is an established relation of the scheme to clientelism with corruption being manifested in many stages of the participation procedure. Also, according to Sotiropoulos (2004), state centralization is associated with slow procedures and ambiguous legal frameworks which may increase farmers' perception of corruption and restrict their participation in the scheme.

Changes in farmers' perception of the economic crisis have an impact on farmers' willingness to participate in the investment aid scheme. More specifically, if farmers' perception about the economic crisis impact is negative, the probability of the farmer being willing to participate in the scheme would be higher compared with those who do not perceive such an impact. The fact that a farm crisis can lead farmers to take advantage of the opportunities offered by the CAP to fund investment on their farms was also mentioned by Maye et al. (2009) who said that in times of crisis investing in diversification "becomes more significant as a business pathway" as it can offer farm businesses a "positive crisis-recovery strategy". Optimism for the future, as expected, was positively related with the probability of participating in the investment aid scheme as farmers who were more optimistic about the future were more likely to participate in the scheme than those who were less optimistic.

The first TPB (Financial\_imp) factor is positively correlated to participation to the scheme. Results show that by increasing their evaluation of "Financial\_imp" by 1 unit (e.g. from 6 to 7 in a 1–10 scale) the probability that the farmer answers "probably yes" or "definitely yes" to participate in the scheme

**Table 7**

Marginal effects of explanatory variables on the outcomes of the probit model estimating vine-growers' intention to participate in the investment aid subsidy scheme with corrected sample selection.

Variable	Participating in the investment aid subsidy scheme				
	Definitely not	Probably not	Not sure	Probably yes	Definitely yes
Financial imp	-0.0495***	-0.0187***	-0.0110***	0.0362***	0.0429***
Idealists imp	-0.0116	-0.0044	-0.0026	0.0085	0.0101
Control imp	-0.0454***	-0.0172***	-0.0101***	0.0333***	0.0394***
Recession	-0.0634*	-0.0240	-0.0141	0.0464*	0.0550
S future	-0.0479**	-0.0181*	-0.0106	0.0351**	0.0416**
Corruption	0.0882***	0.0334***	0.0196***	-0.0646***	-0.0766***
imp	-0.1112***	-0.0420***	-0.0247**	0.0814***	0.0965***
Island vineyards	-0.0072	-0.0027	-0.0016	0.0053	0.0062
Mountain vineyards	-0.0077	-0.0029	-0.0017	0.0056	0.0067
Coastal vineyards	-0.0095	-0.0036	-0.0021	0.0070	0.0082
Part-time vineyards	0.0104	0.0039	0.0023	-0.0076	-0.0090
Estate vineyards	-0.0126	-0.0048	-0.0028	0.0092	0.0110
Hobby vineyards	-0.0044	-0.0017	-0.0010	0.0032	0.0038
Previous participation imp	0.1112***	0.0420***	0.0247**	0.0814***	0.0965***
Age	-0.0012	0.0005	0.0003	-0.0009	-0.0010
Educ	-0.0301	-0.0114	-0.0067	0.0221	0.0262

\* Statistically significant at 0.1 level of significance.

\*\* Statistically significant at 0.05 level of significance.

\*\*\* Statistically significant at 0.01 level of significance.

increases by 7.91%. This factor also relates to social norms and farmers' social and occupational identities and the positive relation of these to participation in schemes agrees with the results of researchers like Dessein and Nevens (2007) and Burton et al. (2008). It has also been mentioned by Jongeneel et al. (2008) that there is a relationship between perceived farming social identity and participation in multifunctional schemes.

The factor describing perceived behavioural control was significantly and positively correlated, meaning that farmers who find it easy to acquire information, understand the law and collaborate with the authorities are more likely to participate (increase probabilities of positive outcomes by 7.91%). Previously, in England, Elliott et al. (2003) had also found that farmers perceived the procedures of applying to be complicated and those who find help, or think they did not need it, are more likely to apply for a subsidy. For the case of Greek farmers this result is also in accordance with other authors who have studied the relation of the investment aid to the ability to overcome the bureaucratic procedures and influence the authorities such as Papadopoulos (1997) and Karanikolas and Martinos (2007).

Previous participation in the scheme was found to be statistically significant and had a positive influence on increasing the probability of participating in the scheme. Farmers who previously participated in the scheme were 17.8% more likely to be willing to participate again than those with no previous experience of participating in the scheme. This finding is similar to the findings of others on farmers' participation in Rural Development Schemes (e.g. Vanslebrouck et al., 2002).

Regarding vine-growing systems, it was found that farmers with large areas of fragmented vineyards, or parts of wine-making estates, were keen on participating in the investment aid scheme. Only those with much larger vineyards were more likely to participate in the scheme, possibly due to their owners finding it easier to financially support an improvement plan. Farmers with other vine-growing systems were not found to be very interested in participating in the investment aid scheme.

### 3.2.2. *Organic farming scheme*

Table 8 shows the results of the ordered probit model that estimated vine-growers' intention to participate in the organic subsidy scheme before and after the sample selection. Results of the selection model are shown in Appendix C Table C.4. The correlation coefficient  $\hat{\rho}_2$  between the ordered probit and selection model was not statistically significant, meaning that correction was not necessary to extract reliable results. Therefore, the model chosen for discussion here is a standard ordered probit model (see first column of Table 8). Table 9 shows the marginal effects of the explanatory variables on each outcome of the model. (Marginal effects of the selectively corrected model are presented in Appendix C Table C.1.) From the results shown in Tables 8 and 9, we can see that the second TPB factor describing the importance of issues such as environmental and landscape protection (Idealists org) was, as expected, significantly and positively correlated with farmers' intention to participate in organic vine-growing. This result is similar to that of Burton et al. (2003) who found that environmental awareness increased the possibility of farmers adopting agri-environmental schemes. In particular, it was found that having a unit's increase in the value of this factor increases the probability of a positive outcome (5 = definitely yes or 4 = probably yes) by 2.84%.

The factor describing perceived behavioural control (Control org) also has significant and positive correlation, meaning that farmers who are positive about dealing with authorities, or farmers who think that they can overcome institutional obstacles, are more likely to participate in the scheme. More specifically, the probability that farmers are willing to participate in the scheme increases by 5.60% with a one unit increase in farmers' perception of control. This result was expected, based on the original discussions with farmers, and generally agrees with Laple (2010) and Hansson et al. (2012) who highlighted the influence of this kind of psychological factor on adoption of new measures.

As far as vine-growing systems are concerned, three systems have statistically significant coefficients. Traditional terraced vineyards on the islands with low mechanization rates were negatively correlated with participation in the organic vine-growing scheme. The probability of a positive outcome decreases when respondents tend to be part of that vine-growing system.

**Table 8**

Determinants of farmers' willingness to participate in the subsidy scheme for organic vine-growing.

Explanatory variables	Standard model		Corrected model	
	Coef.	z	Coef.	z
Idealists.org	0.135***	3.04	0.159***	2.86
Financial.org	0.027	0.47	-0.010	-0.16
Control.org	0.267***	4.71	0.208***	3.31
Recession	0.270	0.95	0.116	0.38
S.future	0.018	0.11	-0.028	-0.15
Corruption.org	-0.285	-1.29	-0.414*	-1.66
Previous Participation.org	1.585***	5.59	1.644***	5.61
Island vineyards	-0.113**	-2.16	-0.104*	-1.80
Mountain vineyards	0.099**	1.90	0.159***	2.72
Coastal vineyards	-0.220***	-3.91	-0.171***	-2.58
Part-time vineyards	0.034	0.74	0.071	1.19
Estate vineyards	-0.005	-0.10	0.054	0.84
Hobby vineyards	0.014	0.36	0.014	0.27
Age	-0.017***	-2.66	-0.013	-1.38
Education	-0.189	-0.87	-0.330	-1.37
$\mu_{12}$	0.3708		0.5373	0.57
$\mu_{22}$	1.4440		1.7704*	1.88
$\mu_{32}$	1.8751		2.1260**	2.23
$\mu_{42}$	2.5978		2.8274***	2.94
$\hat{\rho}_2$	0.0490		0.10	

\* Statistically significant at 0.1 level of significance.

\*\* Statistically significant at 0.05 level of significance.

\*\*\* Statistically significant at 0.01 level of significance.

**Table 9**

Marginal effects of explanatory variables on the outcomes of the probit model estimating vine-growers intention to participate in the subsidy scheme for organic farming.

Variable	Outcome				
	Definitely not	Probably not	Not sure	Probably yes	Definitely yes
Financial.org	-0.0073	0.0003	0.0012	0.0022	0.0035
Idealists.org	-0.0359***	0.0016	0.0060**	0.0110***	0.0174***
Control.org	-0.0710***	0.0031	0.0119***	0.0217***	0.0343***
Recession	-0.0716	0.0031	0.0120	0.0219	0.0346
S.future	-0.0050	0.0002	0.0008	0.0015	0.0024
Corruption.org	0.0756	-0.0033	-0.0126	-0.0231	-0.0366
Previous participation.org	-0.4199***	0.0184	0.0701***	0.1283***	0.2031***
Island vineyards	0.0301**	-0.0013	-0.0050	-0.0092**	-0.0146**
Mountain vineyards	-0.0264*	0.0012	0.0044*	0.0081*	0.0128**
Coastal vineyards	0.0584	-0.0026	-0.0098***	-0.0178***	-0.0283***
Part-time vineyards	-0.0092	0.0004	0.0015	0.0028	0.0044
Estate vineyards	0.0014	-0.0001	-0.0002	-0.0004	-0.0007
Hobby vineyards	-0.0039	0.0002	0.0007	0.0012	0.0019
Age	0.0045***	-0.0002*	-0.0008*	-0.0014	-0.0022**
Education	0.0501	-0.0022	-0.0084	-0.0153	-0.0242

\* Statistically significant at 0.1 level of significance.

\*\* Statistically significant at 0.05 level of significance.

\*\*\* Statistically significant at 0.01 level of significance.

These findings concur with Papadopoulos and Papanikos (2005) who found that vine-growers on islands are not attracted to agri-environmental schemes. Modern, and profit-oriented, vineyards with high rates of mechanization in coastal areas were negatively correlated with participation in organic vine-growing. This result is in line with Oxouzi (2008) who found that farmers with profit-orientated vineyards are less likely to adopt organic farming. In contrast, hill-side vineyards in mountain areas were positively associated with participation in the organic vine-growing scheme. Wine-making estates, part-time and hobby vineyards did not have statistically significant coefficients but this could be due to the nature of the scheme, as eligibility rules often exclude part-time farmers from receiving subsidies (Oxouzi, 2008).

Previous participation in the scheme is an important factor in terms of influencing farmers' intentions to participate in the organic scheme. The probability of farmers being willing to participate was 33% higher for farmers who participated in the scheme before, than those who were not in the scheme.

Perception of corruption was not found to be significantly co-related to farmers' intentions to participate in the organic vine-growing scheme. Similarly, their perception of the impact of the economic recession and optimism for the future were not significantly co-related to the probability of participating in the scheme. Furthermore, after discussion with farmers, it was found that they believed that corruption does not have a significant effect on entry to the organic scheme as there is relatively little money involved. In addition, many vine-growers that want to be organic can be so without participating in the scheme and, therefore, they are not intimidated by corruption. As far as the economic recession is concerned, organic farming does not involve large investment and is not as highly related to the profitability of the vineyards as is the investment aid scheme. In addition, for those farmers that become organic for moral or ethical reasons, the current economic situation has little influence on their beliefs.

Farmers' age was found to be negatively related to their intention to participate in the organic vine growing scheme ( $p$ - value < 0.01) which is in accordance with other studies on adoption of organic farming (e.g. Anderson et al., 2005; Padel, 2008).

Education level was found to not be associated with farmers' participation in the organic vine-growing scheme whereas based on previous research (e.g. Damianos and Giannakopoulos, 2002; Oxouzi, 2008), it would be expected that the more educated farmers would be keener to adopt organic farming than others. However, it could be that, better educated farmers have a higher understanding of the constraints imposed by legislation and bureaucracy, and the associated difficulties of applying organic practices on farms, than the less educated ones.

#### **4. Conclusions**

In this paper, we discuss the impact of several factors on Greek vine-growers' decisions to participate in two voluntary RD schemes—namely the Investment Aid Scheme and the Organic Farming Scheme. These factors included perception of corruption, perception of the economic recession, farming systems and farmers' attitudes and beliefs.

Results indicated that perceived corruption in the implementation of the Rural Development Policy is an important negative driver for farmer participation especially for the Investment Aid Scheme. Also, psychological constraints play an important role in farmers' participation intentions, especially those related to Perceived Behavioural Control (i.e. access and interaction with the authorities). Farmers' perception of the current economic recession in Greece was found to be correlated positively with farmers' willingness to participate in the schemes. Regarding farming systems, only large estate vineyards had the intention to participate in the Investment Aid Scheme while, for the Organic Scheme, some farm types were more influential than others. Finally, participation was motivated by financially related factors and factors related to protection of the environment for the Investment Aid Scheme and the Organic Farming Scheme, respectively.

These findings indicate that there is a need for a range of policy solutions that would enhance vine-growers' participation in RD schemes. Two main policy implications are derived from our analysis. First, that the strategies for RD scheme participation should include significant changes in the way RD schemes are administered (i.e. its design and implementation). The second is that there is a need for finding ways to facilitate effective communication between RD stakeholders, mainly the farmers and the policy makers. Several policy options can be suggested to nudge farmers to participate in RD schemes.

First, a large proportion of farmers perceive the government as corrupt. However, since the main way in which corruption is manifested is through the use of informal networking, farmers who believe that they have access to informal networks are more likely to participate in such schemes. Hence, there is a need for a fiscal framework that mitigates the factors providing grounds for corruption—such as complex legislation, red tape and state centralization—to reduce its negative perception by farmers.

For instance, the introduction of modern IT technologies, as well as ensuring anonymity in the initial stages of the application process for schemes, could help to reduce the perception of unfairness in the application process and the perceived need for networking. Additionally, a more controlled budget allocation combined with public information on its distribution amongst farmers and regions could build up trust in government. Also, assigning trained staff at the local administrative level could reduce farmers' potential interactions with external networks and lessen the idea that submitting an application is problematic (Elliott et al., 2003).

Second, contrary to policy makers' beliefs on the linkage between reception and participation in schemes (Hellenic Ministry of Agricultural Development and Food, 2012), we found that farmers' would be more keen to participate in RD schemes if they perceive effects of the economic recession on viticulture to be negative, especially for the Investment Aid Scheme. The ongoing economic crisis has had an impact on other industries, which may have led farmers to reconsider the possibility of staying in farming and taking advantage of schemes that can help finance their businesses. Facilitating access to credit and easing repayment requirements, especially by small scale farmers who may find it more difficult to acquire investment capital (Ministry of Rural Development and Food, 2012), may contribute to dealing with the financial crisis. At the administrative level, ensuring faster payment of subsidies could boost cash flow in the sector and reduce farmers' risk perception. Furthermore, the creation and support of marketing channels, through national and local strategies and interventions that would enforce the circulation of farm products, could provide advantages to farmers (against other employment categories) and increase their willingness to invest in their vine-yards.

Third, our findings indicate that the drivers for participation in the two schemes differ. Financial drivers are important for their participation in the Investment Aid Scheme, whereas non-financial aspects (i.e. idealism) are linked to participating in the Organic Farming Scheme. Also, scheme participation was correlated with certain farm types more than others. Our results indicate that different types of farmers (or farming systems) prefer different policies. Thus, some farmers would be attracted to policy mechanisms that encourage business development while other farmers would sign-up for policies that support the protection of the environment. In this context, it is useful to examine how future policies could accommodate this diversity. Our results indicate the necessity for splitting the Rural Development Programme into more targeted policies tailored to the varying farmers' beliefs and needs.

A further conclusion from this study is that the fewer psychological constraints farmers face in participating in a scheme, the more they are willing to participate in it as was also found in Läßle (2010) and Hansson et al. (2012). Psychological constraints may relate to the social demands of farming life, the lifestyle choices in the LFAs and the interactions with the authorities. Policy response to these caveats may go beyond the framework of the Rural Development Programme and require a more spherical policy approach that encompasses infrastructure improvement, cultural and commercial development of rural areas in non-agricultural teams. Finally, the focus of future RD policies could be on: modernizing rural life; providing a range of social structure alternatives for rural populations; and facilitating farmer' access to the decision-making centres. This finding, however, also implies that knowledge and information provision is very important. Information could act as a method of reducing risk perception and can enable actions at the individual level by changing a person's attitudes. Further, psychological constraints could be overcome through the process of social education in combination with the appropriate incentives for scheme participation.

## Appendix A.

### A. TPB Components

**Table A.1**

The Theory of Planned Behaviour construct for the investment aid scheme.

TPB Element	Questionnaire statement
Personal beliefs	There are delays in payments of the investment aid It is important to receive a subsidy It is profitable to modernize the vine-growing system Vineyard improvement helps reduce production costs Important to maintain my vineyard Improving the vineyard improves product quality It is important to protect the environment It is important to maintain landscape Rural landscapes have aesthetic value Cost of investment for vine-yard improvement is high It is important to expand my business Subsidies are useful to farmers Subsidies help viticulture develop Subsidies are useful to area Useful to improve vineyard It is important to expand vineyard Vine-growing has future potential
Subjective norm	Others expect me to have the best vineyard People think that I should not receive subsidies People consider farmers to be socially lower My relation with the other farmers is good My subsidies are subject to other people's decisions
Perceived behavioural control	My vineyard is not eligible for improvement It is easy to have the necessary connections to receive a subsidy It is easy to apply for the Investment Aid Scheme Subsidies involve long procedures Easy to collaborate with authorities Easy to improve my vineyard It is easy to understand the law There is a lot of red tape in RD scheme participation

**Table A.2**

Theory of Planned Behaviour construct for the organic vine-growing scheme.

TPB element	Questionnaire statement
Personal beliefs	Organic farming lowers yield Organic farming lowers quality standards Organic Farming Schemes has strict rules Organic products have higher prices It is important to receive a subsidy Supplies for organic farming are costly It is useful to be organic Organic products have better quality Subsidies are useful to farmers I am interested in environmental protection Subsidies help viticulture develop Subsidies are useful to area It is important to secure my income It is important to have interests outside farming
Subjective norm	Others expect me to have the best vineyard People think that I should not receive subsidies People consider farmers to be socially lower My relation with the other farmers is good My subsidies are subject to other people's decisions
Perceived behavioural control	It is easy to be organic It is easy to stay in the area It is easy to apply for the Organic Farming Scheme Easy to have the necessary connections to receive a subsidy Subsidies involve long procedures It is easy to collaborate with authorities It is easy to understand the law There is a lot of red tape in RD scheme participation

## Appendix B.

### B. Principal Component Analyses

**Table B.1**

Factor loading of principal component analysis on vine-growing systems.

	Component					
	Island vineyards	Mountain vineyards	Costal vineyards	Part-time vineyards	Estate vineyards	Hobby vineyards
Cooperative	0.620					
Bulk wine production	-0.604					
Training system - cup	-0.603					
Muscat grape	-0.547					
Private consumption	-0.541					
Land formation - terraces	-0.525					
Instructions form the buyer of production	-0.514					
Age of vineyard	0.456					
Planted on bear land	0.393					
Training system - single cordon	0.305					
Land formation - slope		-0.735				
Livestock		0.720				
Debina grape		-0.719				
Grassland		0.708				
No other choice		-0.57				
Other use		0.377				
Tradition		-0.278				
Income security		0.201				
Soultanina grape			-0.838			
Grape merchant			0.804			
Irrigation			-0.638			
Perennial			0.574			
Olives			0.515			
Main income source			-0.458			
Training system - other			-0.418			
Land formation - plain			-0.417			
VQPRD production				0.415		
Land formation - sight slope				0.585		
Replace an old vineyard				-0.576		
Training system - double cordon				-0.538		
Foreign grape				-0.533		
Use of machinery				-0.52		
Table wine production				0.502		
Ask other producers				0.463		
Access from road				0.413		
Hire a consultant				0.390		
Own winery				0.		
Size of vineyard					0.705	
Vineyard rented land					0.697	
Vineyard parcels					0.628	
Decide myself					0.594	
Good income					-0.488	
Lifestyle					-0.430	
Horticulture						0.622
Poultry						0.570
Instruction form suppliers						-0.471
Vineyard already installed						-0.356
Yield						0.283
Other local grape			0.234			

## Appendix C.

### C. Selection model

**Table C.1**

TPB factor loading for intention to continue.

Factor			Component loadings	
Idealists.con	It is important to maintain culture	ATT	0.780	
	It is important to remain in area	ATT	0.736	
	It is important to protect environment	ATT	0.725	
	It is important to maintain landscape	ATT	0.702	
	Maintaining vine-growing is a cultural expectation	NORM	0.696	
	People consider farmers to be socially lower	NORM	-0.519	
	Viticulture is important for my area	ATT	0.513	
	It is easy to stay in the area	CONT	0.496	
Practical.con	It is important to maintain vineyard	ATT		0.617
	Others expect me to have the best vineyard	NORM		0.612
	I would encourage young people to be vine-growers	ATT		0.611
	Vine-growing can ensure an income	ATT		0.564
	Vine-growing is important to my family	NORM		0.534
	Vine-growing has future potential	ATT		0.511
Control.con	It is easy for me to stay in vine-growing	CONT		-0.435
	It is easy to secure my future income for vine-growing	CONT		-0.77
	It is easy to have the lifestyle I want being a vine-grower	CONT		-0.731
	It is important to expand my vineyard	ATT		0.614
	It easy for me to live in a rural environment	CONT		-0.591

**Table C.2**

Description of behavioural factors related to intention to continue vine-growing.

Factor	Description
Idealists.con	Farmers concerned about general issues like area, environment, cultures and traditions and find it easy to stay in their areas
Practical.con	Farmers that find viticulture and vine-growing to be important for them and their families and need it for income support
Control.con	Farmers that find viticulture important but find social and practical difficulties in practicing it

### Estimation results

**Table C.4**

Determinants of farmers' intention to continue vine-growing.

Explanatory variables	Coefficient	z	Marginal effect	z
Age	-0.039 <sup>***</sup>	-3.29	-0.007 <sup>***</sup>	-3.64
Educ	0.122	0.39	0.021	0.36
Island vineyards	-0.156 <sup>*</sup>	-1.77	-0.030 <sup>†</sup>	-1.89
Mountain vineyards	0.011	0.12	0.013	0.2
Coastal vineyards	0.230 <sup>**</sup>	2.37	0.044 <sup>**</sup>	2.53
Part-time vineyards	0.271 <sup>***</sup>	3.15	0.052 <sup>***</sup>	3.48
Estate vineyards	0.039	0.46	0.007	0.44
Hobby vineyards	0.228 <sup>***</sup>	2.89	0.044 <sup>**</sup>	3.13
Idealists	0.168 <sup>*</sup>	1.8	0.033 <sup>*</sup>	1.91
Practical	0.092	1.19	0.017	1.21
Control	-0.046	-0.58	-0.009	-0.67
Hou.mem	0.203 <sup>*</sup>	1.8	0.039 <sup>*</sup>	1.87
sps	0.004	0.01	0.001	0.02
Recession	-0.942 <sup>**</sup>	-2.1	-0.185 <sup>**</sup>	-2.24
S.future	-0.191 <sup>*</sup>	-0.63	-0.033 <sup>*</sup>	-0.58
Main-occup	0.446	1.21	0.084	1.24
.Cons	-0.233	-0.21		
agagh				
Number of obs	204			
LR chi2(16)	67.94			
Prob > chi2	0.0000			
Pseudo R2	0.3319			

\* Statistically significant at 0.1 level of significance.

\*\* Statistically significant at 0.05 level of significance.

\*\*\* Statistically significant at 0.01 level of significance

### Descriptive statistics

**Table C.3**

Descriptive statistics of variables used in the estimation models.

Variable	Description	Mean	Std. Dev
Variables used in the univariate probit on intention to continue			
Island vineyards	Island vineyards	5.464	2.007
Mountain vineyards	Mountain vineyards	3.929	1.922
Coastal vineyards	Coastal vineyards	2.561	1.897
Part-time vineyards	Part-time vineyards	3.458	1.841
Estate vineyards	Estate vineyards	2.433	1.720
Hobby vineyards	Hobby vineyards	3.957	1.967
Age	Age of respondent (years)	49.09	13.764
Educ	1 = college or university, 0 = basic education	0.37	0.485
S.future	Situation will improve in future 1 = yes, 0 = no	0.36	0.482
Recession	Impact of recession 1 = negative, 0 = positive	0.84	0.369
sps	Reception of single payment (1 = yes 0 = no)	0.56	0.497
Hou_mem	Household members (number)	3.19	1.269
Main_occ	Main occupation (1 = farmer, 0 = other)	0.43	0.496
Idealists	TPB factor 1 (normalized from 1 to 10)	6.818	2.022
Practical	TPB factor 2 (normalized from 1 to 10)	6.775	1.817
Control	TPB factor 3 (normalized from 1 to 10)	3.141	1.937

## Appendix D.

### D. Ordered probit models

**Table D.1**

Marginal effects of explanatory variables on the outcomes of the standard ordered probit model estimating vine-growers' intention to participate in the investment aid scheme.

Variable	Outcome				
	Definitely not	Probably not	Not sure	Probably yes	Definitely yes
Age	0.0014	0.0006	0.0002	-0.0011	-0.0012
Educ	0.0004	0.0002	0.0001	-0.0003	-0.0004
Imp	-0.1056***	-0.0485***	-0.0185**	0.0817***	0.0909***
Island vineyards	-0.0054	-0.0025	-0.0010	0.0042	0.0047
Mountain vineyards	0.0034	0.0016	0.0006	-0.0026	-0.0029
Coastal vineyards	0.0041	0.0019	0.0007	-0.0032	-0.0036
Part-time vineyards	0.0113	0.0052	0.0020	-0.0087	-0.0097
Estate vineyards	-0.0078	-0.0036	-0.0014	0.0061	0.0067
Hobby vineyards	-0.0001	-0.0001	0.0000	0.0001	0.0001
FinancialImp	-0.0456***	-0.0210***	-0.0080***	0.0353***	0.0393***
IdealistsImp	-0.0050	-0.0023	-0.0009	0.0039	0.0043
ControlImp	-0.0452***	-0.0208***	-0.0079***	0.0350***	0.0389***
Recession	-0.0675*	-0.0310*	-0.0118	0.0522*	0.0581*
S-future	-0.0358	-0.0164	-0.0063	0.0277	0.0308
Corruption	0.0917***	0.0421***	0.0161***	-0.0709***	-0.0789***

\* Statistically significant at 0.1 level of significance.

\*\* Statistically significant at 0.05 level of significance.

\*\*\* Statistically significant at 0.01 level of significance.

**Table D.2**

Marginal effects of explanatory variables on the outcomes of the selectivity corrected ordered probit model estimating vine-growers' intention to participate in the subsidy scheme for organic farming.

Variable	Outcome				
	Definitely not	Probably not	Not sure	Probably yes	Definitely yes
Island vineyards	0.0289*	-0.0035	-0.0045*	-0.0084*	-0.0125*
Mountain vineyards	-0.0441***	0.0053	0.0069**	0.0129**	0.0190***
Coastal vineyards	0.0476***	-0.0057	-0.0075**	-0.0139	-0.0205**
Part-time vineyards	-0.0199	0.0024	0.0031	0.0058	0.0086
Estate vineyards	-0.0151	0.0018	0.0024	0.0044	0.0065
Hobby vineyards	-0.0040	0.0005	0.0006	0.0012	0.0017
FinancialOrg	0.0030	-0.0004	-0.0005	-0.0009	-0.0013
Idealists.org	-0.0443***	0.0053	0.0070**	0.0129**	0.0191***
Control.org	-0.0578***	0.0069	0.0091**	0.0169***	0.0249***
Recession	-0.0322	0.0039	0.0051	0.0094	0.0139
S future	0.0079	-0.0009	-0.0012	-0.0023	-0.0034
Corruption	0.1151*	-0.0138	-0.0181	-0.0336	-0.0497*
Org	-0.4564***	0.0546	0.0717	0.1331	0.1969***
Age	0.0036+	-0.0004	-0.0006	-0.0011	-0.0016
Educ	0.0916	-0.0110	-0.0144	-0.0267	-0.0395

\* Statistically significant at 0.1 level of significance.

\*\* Statistically significant at 0.05 level of significance.

\*\*\* Statistically significant at 0.01 level of significance.

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