Italian winegrowers' acceptance of results-based agri-environmental schemes

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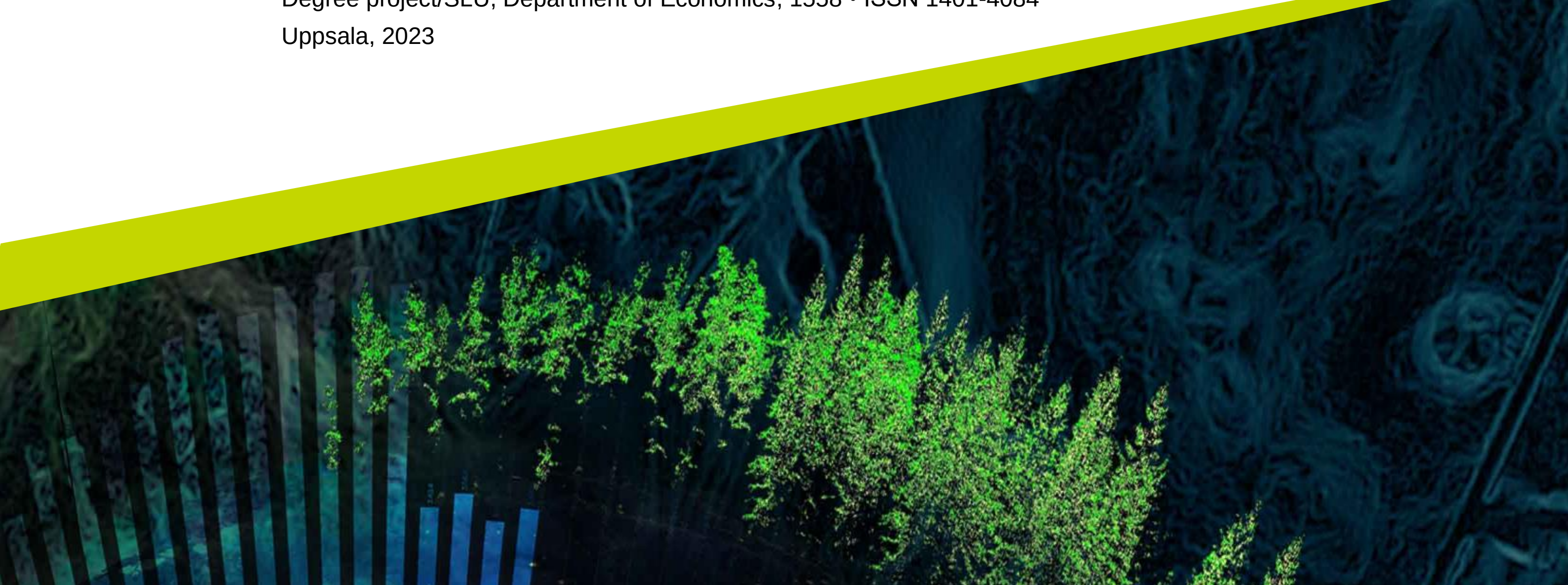

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Abstract

As the debate around the cost-effectiveness of outcome-based agri-environmental schemes (AES) is growing at the European level, the potential of the payment-by-results system is currently being explored by researchers and policymakers. These payment schemes have many benefits. First, farmers can freely use locally adapted agronomical practices to better achieve environmental outcomes. Secondly, the European Union may spend its money in a more cost-effective way, as payments are awarded only if results are achieved. However, since farmers' participation is voluntary and depends on many farms and farmers' characteristics, studies aimed at understanding their preferences are necessary to enhance policy design and adoption. This thesis is the first of this kind to be conducted in Italy. Using a contingent valuation method, we investigated Italian winegrowers' acceptance and intensity of participation in a hypothetical results-based AES targeted at pollinators' conservation in the vineyards. We sent an online survey where participants were split into treatment (rare-species bonus) and control groups. Results show that 71% of participants are willing to participate in our scheme. While a treatment of a randomly assigned rare-species bonus had no effect on the scheme's overall acceptance, it positively influenced participation intensity. Results indicate that participants who were previously enrolled in an AES and women are more likely to enrol. Behavioral factors appear to be related to both acceptance and intensity. Considering this, the study suggests potential strategies to encourage farmer participation in results-based AES and promote biodiversity conservation.

Keywords: outcome-based agri-environmental schemes, Italy, contingent valuation method, common agricultural policy

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Abbreviations

AES	Agri-environmental scheme
EU	European Union
HNV	High Nature Value
CAP	Common Agricultural Policy
CVM	Contingent Valuation Method
RBPS	Result-based payment schemes
DCE	Discrete choice experiment

1. Introduction

This thesis assesses Italian winegrowers' acceptance of a hypothetical results-based agri-environmental scheme (AES) targeting biodiversity conservation in vineyards through a contingent valuation method (CVM) study. In the last 40 years, European agricultural land has suffered from a noticeable decrease in biodiversity levels across the continent (Brown et al., 2021). The CAP 2023-2027 is equipped with new opportunities and tools to further sharpen its focus on tackling biodiversity and climate crises. Among these, results-based agri-environmental schemes (AES) seem highly ambitious, as they make payments conditional on delivering ecological results in terms of goods and services. However, the voluntary character of AES makes farmers' participation dependent on demographic and farm characteristics, on contracts' features (e.g., flexibility, transaction cost, and bureaucracy), and on farmers' behavioral factors and socio-economic attitudes (Massfeller et al., 2022; Šumrada et al., 2022; Tanaka et al., 2022; Paulus et al., 2022; Wezel et al., 2018; Birge et al., 2017; Kuhfuss et al., 2016; Schroeder et al., 2012). In this regard, understanding farmers' preferences may help to improve environmental policy design and enhance farmers' adoption of the measures (OECD, 2022).

Results-based schemes are gaining attention from EU policymakers, as they represent an alternative to traditional agri-environmental schemes (Simpson et al., 2023). Since their introduction[1], the AES' reward mechanism is typically action-oriented, meaning that the payments are provided based on the adoption of specific land management practices, regardless of the environmental outcome. Even though this system has proven to provide many benefits in the last decades, three main issues still need to be considered: (1) many ecological examinations have found that the biodiversity objectives are rarely met, (2) monitoring of the expected benefits is inappropriate, and (3) there is a lack of evidence of the cost-effectiveness of measures (Kleijn et al., 2004; MacDonald et al., 2019; Pinto-Correia et al., 2022). This last issue is the most urgent as well as the most related to the aim of this thesis.

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[1]For more information on the regulation that made AES mandatory within the European framework, see Council Regulation (EEC) No 2078/92 of 30 June 1992 on agricultural production methods compatible with the requirements of the protection of the environment and the maintenance of the countryside (OJ L 215 30.07.1992, p. 85, ELI: http://data.europa.eu/eli/reg/1992/2078/oj).

As the AES budget keeps growing, European citizens demand that the EU invest cost-effectively in it (Ait-Sidhoum, 2020). In this regard, results-based payments may improve the efficacy of the payment system “as compensation is only paid for results achieved, thus avoiding payment for non-delivery” (Burton and Schwarz, 2013). Other studies have also confirmed this (Sidemo-Holm et al., 2018; Batary et al., 2015; Gibbons, 2011; Matzdorf et al., 2010). Furthermore, such schemes allow landowners to fully use their experience and knowledge and select the context-specific agronomical practices that best achieve ecological results (Wuepper et al., 2022; Sidemo-Holm et al., 2018; Burton and Schwarz, 2013). The flexibility given to farmers is also expected to be beneficial for the overall cost-effectiveness of the schemes by decreasing budgetary costs. Allowing farmers to choose the least-cost practices may lower the compensation needed (OECD, 2022).

Results-based AES also face challenges. First, according to OECD (2022), monitoring tools may be inadequate or too costly to accurately track environmental outcomes. Secondly, the rewarding system of outcome-based contracts may lower farmers' enrolment, as they are exposed to the risk of not achieving the outcomes. As we know from the literature, risk and uncertainty influence European farmers’ decision-making regarding agricultural practices (Iyer et al., 2019). For the above reasons, it seems relevant to understand how the results-based approach is perceived by the farming community before implementing it.

The aims of this thesis are threefold: we will (1) experimentally investigate whether a rare-species bonus payment increases the overall acceptance and intensity of enrollment in a hypothetical results-based AES from Italian winegrowers; (2) analyse how risk attitudes and behavioral factors affect participation; and (3) estimate the impact of farm-level heterogeneity on the overall willingness to accept the scheme and on the intensity of participation in results-based AES. As such, the research fits well within a broader research framework aimed at understanding European farmers’ perspective of results-based payments. Although there is consistent literature on the effectiveness of results-based as compared to action-based AES in terms of improvement in ecological deliveries and cost-effectiveness (Chaplin et al., 2021; Sidemo-Holm et al., 2019; Borner et al., 2017; Schwarz et al., 2008; Kleijn et al., 2003; Primdahl et al., 2001), studies assessing farmers’ acceptance of outcome-based payment system are quite scarce. Among these, research conducted in Japan showed farmers are willing to participate in outcome-based schemes (Tanaka et al., 2022). According to the authors, these results may also be extended and applied to the EU context. Similar conclusions were obtained from a pilot results-based AES in a typical sub-Mediterranean High Nature Value (HNV) farming system in Slovenia: landowners prefer the payment-by-results system rather than the existing management-based schemes (Sumrada et al., 2021).

Massfeller et al. (2022) showed that the greatest barriers to German farmers' acceptance are time constraints in terms of the expected bureaucratic burden and the perceived risk of the scheme. A similar study in England concluded that the acceptance of results-based AESs is influenced by both the scheme design as well as farmers' demographic and business characteristics (Schroeder et al., 2012).

The present research adds to the literature by bringing in further evidence from Italy, a country that, to our knowledge, lacks representation in the field. This is probably due to results-based schemes being mainly present in Northern and Central Europe, with Mediterranean member states mostly adopting action-based schemes (Allen et al., 2014). European countries that are including RBPS in their 2023-2027 national CAP Strategic Plans are Germany, Ireland, Romania, the Netherlands, the Czech Republic, and Austria. Furthermore, in contrast with other EU countries, policymakers still have limited experience in how farmers approach environmental incentive schemes in Italy (Defrancesco et al., 2008).

The choice of focusing on winegrowers' preferences comes from many reasons. According to Allen et al. (2014), one of the objectives for which results-based payment schemes (RBPS) are most appropriate is the maintenance of the floristic diversity of vineyards. In this regard, Chou et al. (2018) have shown the whole production process may benefit from the rich presence of plants and animals, even though researchers and winegrowers have long agreed that biodiversity in vineyards may be limiting in terms of expected yields. Nevertheless, results-based agri-environmental schemes targeting biodiversity conservation in vineyards are currently scarce in Europe, with only one currently ongoing in Switzerland. Increasing their presence throughout Europe may thus help in reducing the risk of wild species loss. Advantages to the producers may also arise. Results from a discrete choice experiment (DCE) conducted in Italy revealed that consumers are willing to pay a premium price for biodiversity conservation practices in vineyards (Mazzocchi et al., 2019). Furthermore, the wine sector is one of the most representative and promising industries of the Italian economy, with the country ranking as the first wine producer worldwide (Pomarici et al., 2021). As Italian production is expected to keep growing in the following years (Allianz Trade, 2022), and probably resulting in land management intensification, it is fundamental to provide winegrowers with the necessary measures and opportunities to preserve biodiversity.

The remainder is organised as follows. In section 2, we delve into behavioral factors and formulate the research hypotheses. In section 3, the materials used, and the methodology employed are presented. Section 4 shows the results of the econometric analysis. Lastly, section 5 is dedicated to the discussion and policy implications of the study, while section 6 is to the conclusions.

2. Behavioral factors and hypotheses

Behavioral factors are “emotional, personal and social processes or stimuli underlying human behavior” (American Psychology Association, 2018). As they are expected to influence farmers’ voluntary adoption of sustainable farming practices, especially in the light of results-based AES (Déssart et al., 2019), it is appropriate to consider them in the context of this study. Following Massfeller et al. (2022), the classification made by Déssart et al. (2019) into dispositional, social, and cognitive factors was adopted.

Dispositional factors are related to an individual’s values, beliefs, and personality. In the agriculture context, they are expected to affect risk tolerance, farming objectives, as well as resistance to change. For the scope of this thesis, environmental concern is the only dispositional factor considered. Farmers who are more environmentally conscious are more likely to adopt sustainable farming practices (Läpple and Van Rensburg, 2011).

Social factors are related to farmers’ interactions with other individuals (social approval and comparison) and to the need for social status (signalling motives). Individuals are more willing to engage in prosocial behaviors (actions that benefit society as a whole) when such actions imply social recognition (Bénabou & Tirole, 2006). This means that social factors are expected to have a strong influence on farmers’ decision-making processes and their adoption of sustainable agricultural practices. In this study, the effect of signalling is analysed. Since participating in agri-environmental schemes improve local public image and status (Defrancesco et al., 2008), farmers who are concerned with recognition from society are more willing to enrol in such measures (Déssart et al., 2019).

Lastly, cognitive factors are concerned with farmers’ perceptions of the benefits and risks related to a specific AES as well as with their own ability to reach the goals without drastically changing the agronomical practices used. For this study, the cognitive factors employed are perceived risk, financial benefit and perceived control. Perceived risk is related to the financial risks that farmers predict to be associated with sustainable farming practices (Déssart et al., 2019). Understanding farmers’ risk preferences is essential for policymakers to address risk-related challenges in the context of agricultural economics (Rommel et al., 2022; Iyer et al., 2019). Contrarily, the financial benefit is connected to farmers’ perceptions of the expected financial benefits (e.g., tax benefits, higher returns, premium prices, etc.). Finally, perceived control concerns farmers' expectations of their own skills to act or to achieve the expected environmental outcomes (Defrancesco et al., 2008). Table 5 shows a more comprehensive overview of the behavioral factors included in this study and the statements used to capture them.

Given the aims of the thesis, two research hypotheses (H1 and H2) have been formulated, each referring to the general willingness to adopt and to the intensity of participation (measured in terms of the area willing to enrol for the scheme) respectively. These research hypotheses can be further broken down as follows:

$H1_a$: Offering farmers a rare-species bonus increases the likelihood of participation.

$H1_b$: Risk-averse farmers are less likely to accept the scheme.

$H1_c$: Environmentally concerned farmers are more likely to accept the scheme.

$H1_d$: Signalling increases the likelihood of acceptance.

$H1_e$: Higher perceived risk of the scheme decreases the likelihood of acceptance.

$H1_f$: Higher perceived financial benefit and higher perceived control of the scheme increase the likelihood of acceptance.

$H2_a$: A higher payment level increases the intensity of participation.

$H2_b$: A rare-species bonus increases the intensity of participation.

3. Materials, Data, and Methods

3.1 Contingent Valuation and the hypothetical scenario

The Contingent Valuation method (CVM) is a stated preference technique aimed at eliciting individual preferences to attribute monetary value to non-market goods and services (OECD, 2018). Participants are presented with a hypothetical scenario, and they are asked to answer questions as if they were in a real market (Haab and McConnell, 2002).

The hypothetical scenario of this thesis consists of a results-based measure whose primary objective is biodiversity conservation. The secondary objective of the scheme is the promotion of pollinators' presence in wild species-rich vineyards. This fits well into the current context as pollinators are vulnerable to agricultural intensification, and their preservation is crucial for overall biodiversity (Potts et al., 2016; Ollerton et al., 2011). Furthermore, the CAP post-2020 reform holds a great focus on pollinators' safeguards, as Cole et al. (2020) predicted and recommended in their analysis of the CAP 2023-2027 potentialities.

As outlined in the literature, the efficiency of RBPS is strictly linked to the choice of the most suitable biodiversity indicators (Elmiger et al., 2023; Herzon et al., 2018; Burton & Schwarz, 2013). In their review of the indicators used for results-based AES, Elmiger et al. (2023) found out that (1) these can be either unidimensional (focusing on single species; e.g., birds' nests or indigenous tree species) or composite (using composite indexes; e.g., several structuring or landscape elements), with the first more frequently used; (2) most indicators are vascular plants; and (3) the chosen species are sometimes rare or endangered.

Unidimensional indicators were chosen for two reasons. Firstly, we expected these to have a positive impact on farmers' response rate, as they are more immediate to capture in a survey; whereas a composite index may be tedious to understand. Secondly, this is in line with Masseffeller et al. (2022) and Tanaka et al. (2022), two studies this thesis takes inspiration from and relates its results to.

Our indicators are a list of five nectar-rich wild plant species that represent a source of food for pollinators (Table 1). They are thus expected to boost Hymenoptera and Lepidoptera's presence. The indicators chosen are based on Bellucci et al., (2021). Farmers' and agronomists' recommendations were also considered in the final decision.

Table 1. Summary of the hypothetical results-based AES

Country	Primary objective	Secondary objective	Unidimensional indicators	Threshold for payment
Italy	Biodiversity conservation	Promotion of pollinators presence in the vineyards	5 nectar-rich wild plant species	4 nectar-rich wild plant species

Since adapting to smaller regional and target habitat conditions is essential to preserve biodiversity (Elmiger et al., 2023), we presented winegrowers with four different plant lists, each for a specific Italian macro-area (North-West, North-East, Center, South). Three species were kept identical for all the areas, as they are commonly detectable in vineyards throughout the country: *Taraxacum officinale, Capsella bursa-pastoris,* and *Papaver rhoeas.* This has been confirmed by experts and farmers. The other two were geographically varying, so each area had two species closely linked to that specific territory (Table 2).

Inspired by the PAULa agri-environmental scheme 'Kennartenprogramme' in the German region of Rheinland-Pfalz[2] (Western/Southwestern Germany), the annual payment of our hypothetical results-based AES is conditional on the occurrence of at least four key species out of the list of five we presented (Table 1).

Finally, following Elmiger et al. (2023), we introduced an additional bonus payment as an experimental treatment (randomly shown to half of the participants), in case a rare or endangered species is found. The selected plants were also based on Bellucci et al. (2021) and are presented in Table 2. As it is equivalent to 30€/ha/annual, the bonus may be classified as a type of nudge/behavioral intervention as the payment level is low enough to not be considered a substantial economic incentive.

Table 2. Summary of the indicators according to geographical area

North-West	North-East	Centre	South
Taraxacum officinale	*Taraxacum officinale*	*Taraxacum officinale*	*Taraxacum officinale*
Capsella bursa-pastoris	*Capsella bursa-pastoris*	*Capsella bursa-pastoris*	*Capsella bursa-pastoris*

[2]For more information on the PAULa project see Paula Agri-Environment Schemes – Europa at: https://enrd.ec.europa.eu/sites/default/files/de-paula-agri-environment-schemes-gp_web.pdf.

Papaver rhoeas	*Papaver rhoeas*	*Papaver rhoeas*	*Papaver rhoeas*
Arabidopsis thaliana	*Salvia pratensis*	*Lavandula stoechas*	*Trifolium repens L.*
Geranium molle	*Linaria vulgaris*	*Malva sylvestris*	*Cichorium intybus*
Bonus species	Bonus species	Bonus species	Bonus species
Papaver argemone	*Silene noctiflora*	*Anthemis arvensis*	*Agrostemma githago*

Interviewed winegrowers were also provided additional information about the monitoring of scheme results. This is carried out by themselves through visual assessment, as it is mostly done in results-based AES (Elmiger et al., 2023). Following existing and proposed RBPS, farmers must record the species observed in every row and note it on a record sheet. Moreover, they were told that the presence may be randomly checked by assessors. This was aimed at enhancing the scenario's credibility. Based on similar studies (Massefeller et al., 2022), we also informed participants of regional advisors' availability to advise them on the management needed to integrate their agricultural operations as well as on how to autonomously recognize the plant species indicators.

3.2 Survey design

The structure of the survey was as follows. After a brief and broad explanation of the aims of the study through informed consent, participants were asked general questions regarding their farms (ex: "*Where is your farm located*?"; "*Is your farm organic*?"). A short introduction to AES's objectives was displayed (whereas some may have been unfamiliar with them) followed by the presentation of our hypothetical scenario (as in Table 1 and Table 2). At this stage of the survey, to test hypothesis $H1_a$ (bonus treatment increases the likelihood of participation), participants were randomly assigned to treatment (bonus payment for rare species) and control (no bonus payment for rare species) groups. The treatment received the following additional information: "*Additionally to the base payment, you may receive a bonus payment for the presence of a particular rare species. The bonus is equivalent to 30€/ha/year".* After the presentation of the scenario, both groups were asked "*Would you be generally interested in adopting this measure for all or part of your farm*?" (*Yes/No*). Those who stated non-acceptance were asked to indicate the reasons for their choice among: "*It implies too much bureaucracy*" (1); "*It is* *too risky for my yields*" (2); "*It will require drastic agricultural adjustments*" (3); "*I do not think this measure will be implemented*" (4); "*I do not think it is an effective measure*" (5); "*I do not trust CAP's funding system*" (6); and "*Other*" where they could state their own reasons (7). Figure 5 shows the count of the answers to this question.

To test hypothesis $H2_a$ (higher payment increases the intensity of participation), those who stated acceptance were instructed as follows: "*Please, indicate the percentage of land you would like to enrol for each payment indicated below"*. Due to the hypothetical nature of the approach, hypothetical bias is one of the main shortcomings of the CVM (Hausman et al., 2012). One way to reduce hypothetical bias is to introduce "cheap talk" (Cummings & Taylor, 1999). That is why the instructions were followed by "*Please, answer sincerely and considering the current and real situation of your farm*". Bids varying from 70€/ha to 500€/ha were chosen following experts' recommendations and real-life payment schemes. To investigate anchoring effects, participants were randomly assigned to one of the bid vector levels as shown in Table 3, with Level 1 being the lowest and Level 3 the highest. We expect higher payments to increase the percentage of land farmers who would like to enrol, while higher levels (under the presence of anchoring) to decrease it (so that, for example, indicated percentage for 180€/ha would be lower if Level 3 is displayed than when Level 1 is).

Table 3. Bid vectors to estimate the intensity of participation

Level 1	Level 2	Level 3
70€/ha	110€/ha	180€/ha
110€/ha	180€/ha	250€/ha
180€/ha	250€/ha	330€/ha
250€/ha	330€/ha	410€/ha
330€/ha	410€/ha	500€/ha

Because of the intensity question, we were able to identify farmers' supply curve (of environmental services) for our hypothetical results-based AES. To derive it, we first converted the dataset from a wide to a long format. The resulting dataset is a panel data, where each participant who generally agreed has five intensities (one for each of the offered payments in Table 3). To better understand the structure of the long-format dataset, Table 4 shows an example of the participant with Id 3, who was randomly assigned to Level 1. After this transformation, the farmers' supply curve of environmental services was constructed by relating the mean of the indicated percentage of land to the bids offered.

Table 4. Long format: example for Id 3, randomly assigned to Level 1

Id	Payment	Level	Percentage
3	70	1	0
3	110	1	0
3	180	1	70
3	250	1	70
3	330	1	70

After the CVM scenario, to test hypothesis $H1_b$ (behavioral factors and risk attitudes related to acceptance), participants were asked to evaluate 14 statements (see Table 4) concerning behavioral factors on a five-point scale (1 = I strongly disagree; 2 = I disagree; 3 = I do neither agree nor disagree; 4 = I agree; 5 = I strongly agree). After that, farmers had to indicate their level of willingness to take risks in general ("*How willing are you to take risks, in general*?") as well as for their farm ("*How willing are you to make risky decisions regarding your farming business*?") on an 11-point scale from Dohmen et al. (2011) ranging from 0 (extremely risk averse) to 10 (extremely risk seeking).

Following Massfeller et al. (2022), the 14 statements concerning behavioral factors were aggregated into five new variables: perceived risk, perceived control, financial benefit, environmental concern, and signalling (Table 5). The reliability of these new constructs was checked with Cronbach's alpha (α). All the constructs exhibited a good degree of reliability (α > 0.50) as shown in Table 5. Table 5 also displays the statements participants had to evaluate in the survey and that were used to create the above-mentioned behavioral factors. More than one statement was employed to build each construct, except for perceived risk and perceived control of the scheme which are built upon one statement each.

Lastly, participants responded to general demographic questions (i.e., education level, gender, age, agronomical knowledge, etc.).
The whole survey is provided in Appendix A.

Table 5. Statements used in the survey and associated behavioral factors

Statement in survey	Behavioral factor	Cronbach's alpha
Participating in this agri-environmental measure is risky for my business from a financial perspective.	Perceived risk	0.50
It will be easy for me to achieve the results of this agri-environmental measure.	Perceived control	0.48
Participating in this agri-environmental measure will… …be effective in increasing the presence of pollinators. …help mitigate the effects of climate change.	Environmental benefit	0.65
…result in a lower agricultural yield. …result in more bureaucracy. …result in a greater effort in terms of work and time. …result in higher returns.	Financial benefit	0.47
The use of chemicals negatively impacts the presence of pollinators. The environmental issues associated with agricultural activities are exaggerated by the media. Organic viticulture is better for the environment than conventional. The use of chemicals in viticulture is essential for higher yields.	Environmental concern	0.58
I think it's important to show consumers your environmental commitments. I believe that showing consumers your environmental commitments is effective in increasing profits.	Signalling	0.55

3.3 Sampling strategy and sample structure

The target population was Italian winegrowers, with differences in farm size (0-5 hectares; 5-10 hectares; 10-20 hectares; 20-50 hectares; more than 50 hectares), geographical distribution, and whether the production method was organic or conventional. A pilot survey involving 12 winegrowers was conducted in February 2023. After a few adjustments to the questionnaire's structure, data collection started at the end of February 2023 and was concluded at the end of March 2023. Three main channels were employed to reach the target: a mailing list of approximately 4,000 winegrowers, distributed throughout Italy and representative of all sizes (1); the FIVI's (Federazione Italiana Vignaioli Indipendenti) mailing list of about 1,500 winegrowers spanned across the country, with an average vineyard area of 10 hectares and about 51% of the vineyards being cultivated under organic practices (2); social networks (Instagram and Facebook) to reach personal contacts (3).
Among the emails, around 4,000 worked, and 386 answered the survey, with a response rate of 9.65%. After the data cleaning process – which involved excluding those who did not finish the questionnaire and those who answered incorrectly to some questions – 222 observations remained (approximately 5.55% of the estimated total). Among these, 117 were randomly assigned to the rare species bonus treatment, while 105 constitute the control group.

Participating farms, despite being part of a convenience sample, are representative of the target population. The final dataset contains observations from all Italian regions except Molise (see Figure 1). Veneto is the most extensively represented region, accounting for 35 observations, followed by Toscana, Piemonte and Lombardia, while Basilicata and Valle d'Aosta are the less represented regions, comprising 2 observations each.

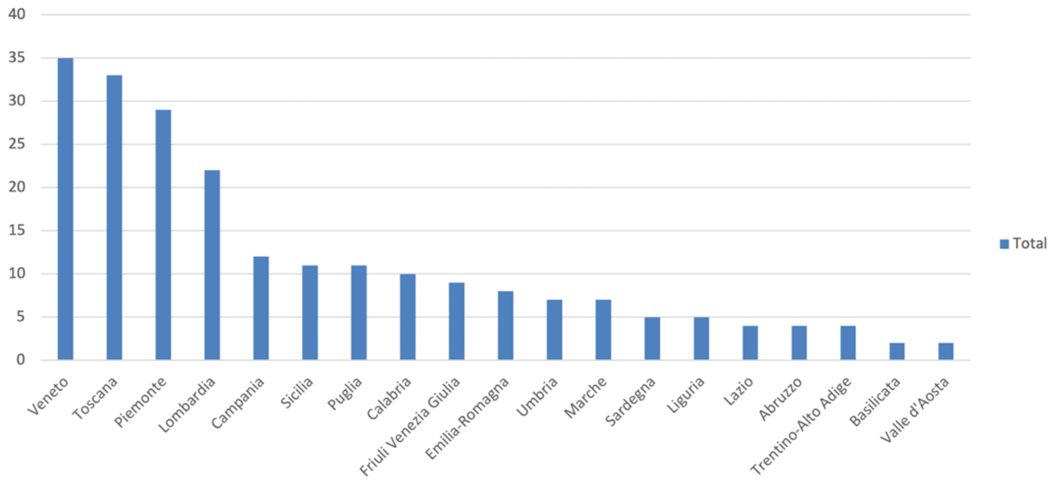

Figure 1. Geographical distribution of the sample

Figure 2 shows the size of the participating farms. Combined, those ranging from 5 to 10 hectares and those between 10 and 20 hectares account for 50.1% of the total (25.6% and 24.5% respectively). Farms with less than 5 hectares constitute 17.1%, while those spanning from 20 and 50 hectares represent 17.9% of the total. Finally, the remaining 14.9% is taken by those sizing more than 50 hectares.

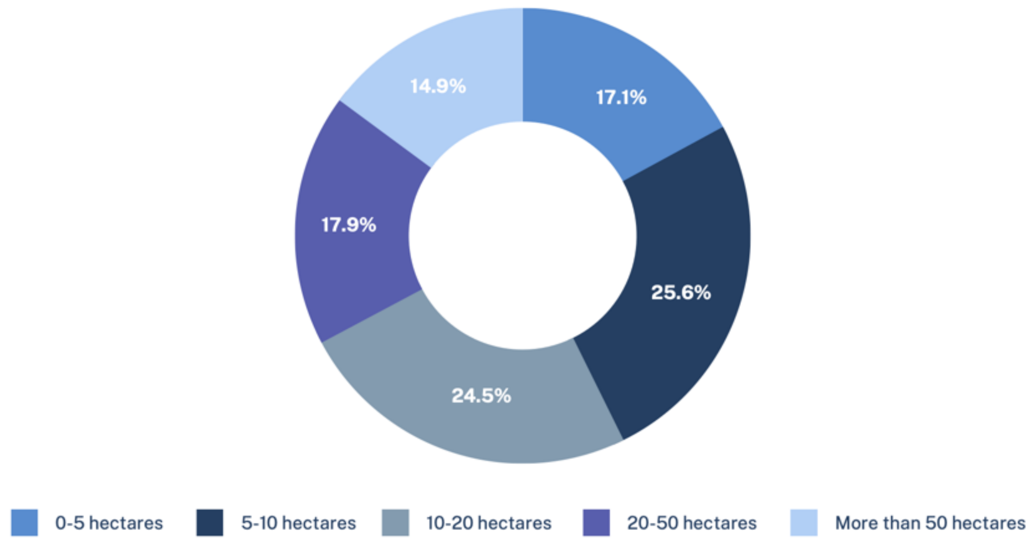

Figure 2. Size distribution of the farms of the sample

Figure 3 represents the percentages of farms based on their production methods: fully organic, partly organic, in transition to organic, not certified, or following other pesticide-reducing agricultural practices (e.g., integrated pest management). Most participants (51.3%) follow organic viticulture for all or part of their farm (37.9% and 8.4% respectively), including those in transition (5%). Notably, the sample is skewed toward organic viticulture when compared to the national average of 21% organic vineyard area in Italy (SINAB, 2023). Lastly, farms without any certifications in the sample account for the 25.3%, while the remaining 23.4% follow other production methods.

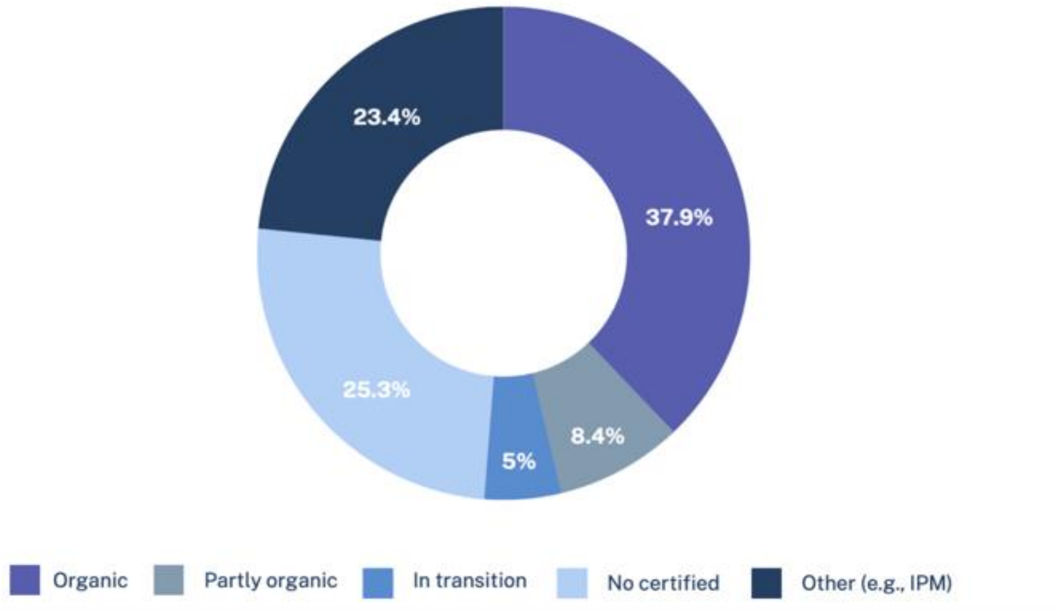

Figure 3. Type of agriculture distribution of the sample

3.4 Empirical modelling

Two equations were estimated to test hypotheses H1 and H2 respectively. The first is called the "acceptance equation" as it is employed to verify the hypothesis concerning the general willingness to adopt the results-based scheme based on a yes or no question of general interest in the scheme. The second is referred to as the "intensity of participation equation" as it is aimed at estimating the area farmers are willing to enrol in the scheme.

To model the acceptance equation, the cross-sectional format of the dataset was employed. Because acceptance is captured by a single binary variable per respondent, to overcome the Linear Probability Model's (LPM) drawbacks (Wooldridge, 2002), the acceptance equation is a probit model as follows:

$$\Pr\left(D_i = 1 \middle| T_i^{bonus}, N_i^{part}, R_i^{risk}, Z_i^{beh}, X_i^{dem}\right) = \phi(\beta^{bonus} T_i^{bonus} + \beta^{part} N_i^{part} + \beta^{risk} R_i^{risk} + \beta^{beh} Z_i^{beh} + \beta^{dem} X_i^{dem}) \quad (1)$$

Where D_i denotes acceptance (D_i=1 if the participant stated acceptance, 0 otherwise), so that:

$$D_i = \begin{cases} 1 \; if \; D_i > 0 \\ 0 \; otherwise \end{cases}$$

T_i is a dummy variable taking the value of 1 if the participant is in the treatment group and 0 otherwise; N_i is a dummy variable taking the value of 1 if the participant has been previously enrolled in an agri-environmental scheme; R_i is a continuous variable representing risk propension taking values from 0 to 10; we decided to keep only the self-reported risk associated to farming decisions and to exclude the general risk attitude due to correlation (and associated risks of multicollinearity) between the two variables. Z_i is a vector of the behavioral factors, and X_i is a vector of demographic variables (farm and farmers' characteristics). Φ indicates the cumulative distribution function of the standard normal distribution.

The intensity of participation equation is the following Ordinary Least Squares (OLS) regression:

$$y_i = P_i^{payment} + \Gamma_i^{level2} + \Upsilon_i^{level3} + T_i^{bonus} + R_i^{risk} + Z_i^{beh} + X_i^{dem} + u_i \quad (2)$$

where y_i is the percentage indicated by farmers for each bid offered, P_i is the bid, Γ_i is the bid level 2, and Υ_i is the bid level 3 (Table 3); level 1 is the reference category. Because in equation (2) the wide format of the dataset was used, we clustered standard errors for the variable "Id" to account for within-respondent correlations of errors.

Due to the corner solution response (the indicated percentage could take only values from 0% to 100%), a Tobit model was regressed as a robustness test for results in (2). The model and its results can be found in the Appendix 2.

4. Results

4.1 Descriptive statistics

Table 6 shows the descriptive statistics for the variables employed in the analysis.

Table 6. Descriptive statistics of variables

Variable	No. of valid observations	Mean	Std. Dev.	Median	Min	Max
Farmers' characteristics						
Age 18-20	0	\	\	\	\	\
Age 21-29	21	0.09	\	0	0	1
Age 30-39	44	0.1	\	0	0	1
Age 40-49	60	0.2	\	0	0	1
Age 50-59	61	0.2	\	0	0	1
Age 60+	35	0.1	\	0	0	1
Male	218	0.7	\	1	0	1
Viticulture as main source of income (1 if yes)	220	0.7	\	1	0	1
Previous adoption AES (1 if yes)	222	0.6	\	1	0	1
Agriculture knowledge (1 if yes)	220	0.6	\	1	0	1
Farms' characteristics						
Organic (1 if organic)	222	0.5	\	1	0	1
Size 0-5	44	0.1	\	0	1	0
Size 5-10	65	0.2	\	0	1	0
Size 10-20	53	0.2	\	0	1	0
Size 20-50	33	0.1	\	0	1	0
Size 50+	27	0.1	\	0	1	0
Cognitive factors						
Perceived risk	222	3.7	0.9	4	1	5
Perceived control	222	3.3	0.9	3	1	5
Environmental benefit	222	3.3	0.5	3.5	2	5
Financial benefit	222	2.6	0.5	2.7	1	4

Dispositional factors						
Environmental Concern	222	3.4	0.8	3.5	1	5
Social factors						
Signalling	222	3.8	0.6	4	1	5
Risk aversion						
Risk Farm	222	5.6	1.9	6	0	10

As far as farmers' characteristics are concerned, most participants fall in the age groups 40-49 (27%) and 50-59 (27.4%). There are no observations of people in the age group 18-20; hence, this group has been excluded from the econometric analysis. Among the whole sample, 157 are male (70.7%), while 61 are female (27.3%). Furthermore, 66.2% of the farmers in the sample have agriculture knowledge, and, for 71.1% of them, viticulture represents the main source of income. Finally, 65.7% were enrolled in an AES at the time of the survey or had done it in the past.

Regarding cognitive factors, most participants (38.7%) rated the perceived risk statement as 4 ("*I agree*"); the perceived control statement was rated as 3 ("*I do neither agree nor disagree*") by 37.8%; similarly, the 73.4% rated the perceived environmental benefit as 4; lastly, the financial benefit was valued 2 ("*I do not disagree*") by the 56.7%. Concerning dispositional factors, environmental concern was rated as 3 by most participants (41.8%). Finally, signaling was valued at 4 by most farmers (45.9%). The self-assessment of risk aversion was rated as 6 by 22% and 7 by 21.6% of the total sample.

4.2 Results of the econometric analysis

Table 6 shows the Average Marginal Effects (AME) of the acceptance equation based on the results of the regression in R.

Table 7. AME of the acceptance equation

	AME	p-value
Treatment (bonus for rare species)	-0.04	0.43
Adoption AES	0.11**	0.03
Age 21-29	0.08	0.46
Age 30-39	-0.05	0.49
Age 40-49	-0.07	0.27
Age 50-59	-0.08	0.21
Size 0-5	0.04	0.57

Size 5-10	0.02	0.74
Size 10-20	-0.006	0.93
Size 20-50	-0.07	0.39
Male	-0.11*	0.04
Main Source	0.01	0.85
Organic	0.02	0.62
Risk	0.04***	0.0001
Signalling	0.09***	0.01
Perceived control	0.10***	0.0001
Perceived risk	0.06*	0.03
Financial benefit	0.02	0.05
Environmental benefit	0.02	0.67
Environmental concern	0.02	0.45

Significance levels: *p < 0.1; **p < 0.05; ***p < 0.01

The rare-species bonus treatment is small and not statistically significant, meaning that hypothesis $H1_a$ is not supported by the data. Based on the AME of Adoption AES, having previously adopted an AES increases the likelihood of enrolment by 11 percentage points on average, with the estimate being significant at 5%. Furthermore, being a male decreases the likelihood of participation by 11 percentage points on average. Being more risk-seeking is associated with an increase in the probability by 4 percentage points on average. Although environmental benefit, environmental concern and financial benefit exhibit no statistical significance, all the other behavioral factors are positively related to acceptance. In particular, the values that participants assigned to the statement concerning risk were reversed, as in Massfeller (2022). Therefore, it makes sense that a one-unit increase in the perceived risk of the scheme increases the likelihood of enrolment by 6 percentage points on average. Lastly, a one-unit increase in signalling and perceived control increase the likelihood by 9 and 10 percentage points on average respectively.

Table 7 displays the results of the three models – progressively more complex – employed to estimate the intensity of the participation equation. In Model 1, we regressed the percentage indicated by participants on the bids offered and on the levels of the bids (the three levels were previously transformed into three dummy variables, where level 1 acts as the reference category). In Model 2, we extended the analysis by adding other control variables: the dummy variable indicating whether the participant was in the treated or control group, the age of the participants (21-29, 30-39, 40-49, 50-59; where 60+ is the reference category), the size of the farms (0-5, 5-10, 10-20, 20-50; where 50+ is the reference category), a dummy for organic/conventional viticulture, and another dummy indicating whether growing grapes is participant's main source of income. Lastly, Model 3 also comprehends the behavioral factors. We left the risk variable out of this equation as we expected this to have a greater impact on the acceptance than on the intensity.

Table 8. Results of the intensity of participation equation (OLS)

	Model 1		Model 2		Model 3	
	Estimate	(SE)	Estimate	(SE)	Estimate	(SE)
Payment	0.19***	(0.01)	0.19***	(0.01)	0.19***	(0.01)
Payment Level 2	-4.10	(3.36)	-6.84**	(3.44)	-7.68**	(3.46)
Payment Level 3	-24.25***	(3.58)	-24.94***	(3.65)	-28.61***	(3.46)
Treatment (bonus for rare species)			7.69***	(2.72)	5.92**	(2.75)
Age 21-29			10.88**	(5.26)	6.30	(4.96)
Age 30-39			10.22**	(4.48)	8.47*	(4.53)
Age 40-49			13.91***	(4.13)	10.39***	(3.91)
Age 50-59			12.99***	(4.37)	14.17***	(4.41)
Size 0-5			11.02**	(5.08)	2.78	(5.20)
Size 5-10			5.79	(4.76)	3.16	(4.65)
Size 10-20			10.26**	(4.88)	4.23	(4.57)
Size 20-50			5.99	(5.48)	0.51	(5.31)
Organic			-3.12	(2.71)	-6.94**	(2.66)
Viticulture as main source of income			6.28**	(3.17)	1.25	(3.22)
Signalling					4.66*	(2.39)
Perceived control					6.87***	(1.72)
Perceived risk					0.85	(1.88)
Environmental benefit					2.03	(2.88)
Financial benefit					11.37***	(2.92)
Environmental concern					1.20	(1.96)

Significance levels: *p < 0.1; **p < 0.05; ***p < 0.01; Standard errors are clustered for respondents (to account for correlated errors within respondents)

Controlling for demographics, farm characteristics, and behavioral factors results in variations in the significance levels of most estimates. The estimates for the age group 21-29 in Model 3 exhibit no significance level when compared to Model 2 (where the estimate was significant at 5%). A decrease in the statistical significance (from 5% to 10%) also occurs for the estimate of the age group 30-39. A similar pattern takes place for Size 0-5 and Size 10-20, which lose any statistical significance when control variables in Model 3 are added. Compared to Model 2 where it is not statistically significant, Organic becomes significant at 5% in Model 3. Viticulture as the main source of income is no more significant at the statistical level in Model 3, as it was in Model 2. The estimate of Payment remains constant across the three models: a one-unit increase in the payment increases the intensity of participation by 0.19 percentage points. The estimates of the two categorical variables (Payment Level 2 and Payment Level 3) indicate the effect of the payment belonging to either level 2 or level 3 with respect to when it belongs to level 1. In Model 3, the estimated coefficient of Payment Level 2 indicates that when the payment belongs to level 2, compared to the reference level, has a decrease of 7.68 percentage points on the dependent variable. Similarly, when it belongs to level 3, the payment decreases the indicated percentage by 28.61 percentage points. Furthermore, being part of the treated group is associated with an increase of 5.92 percentage points in the intensity of participation. This validates hypothesis $H2_b$. Adopting organic viticulture decreases the indicated percentage of land by 6.94 percentage points. Concerning behavioral factors, perceived risk, environmental concern and environmental benefit appear to be not statistically significant. Finally, signalling, perceived control, and financial benefit are associated with an increase of 4.66, 6.87, and 11.37 percentage points respectively.

Figure 4 shows the relation between the payment/ha offered by the scheme and the average percentage of land self-indicated by participants. As expected, they are positively related.

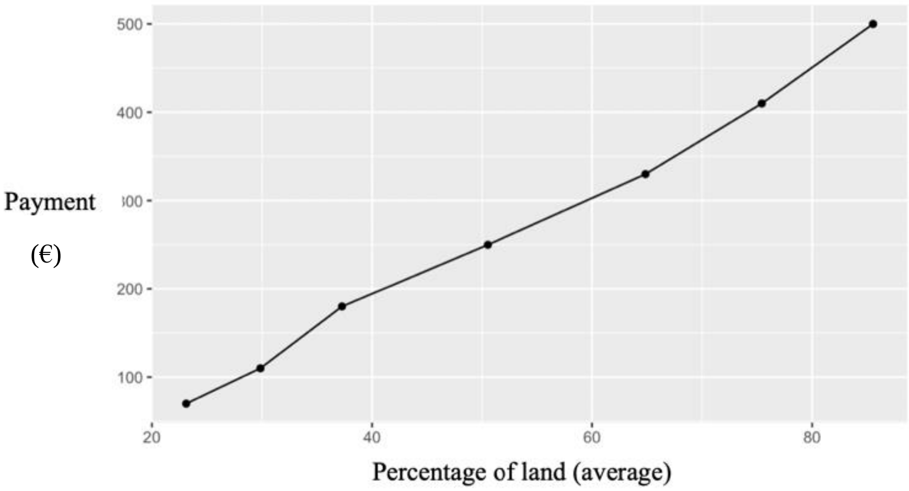

Figure 4. Farmers' supply curve for the hypothetical AES

4.3 Reasons for non-acceptance

Among the 222 participants, 157 could envision enrolling in the hypothetical results-based AES. This means that the acceptance rate is 70.7%. The 65 farmers who stated non-acceptance were asked why. Figure 5 displays the answers to the question. Most participants indicated bureaucracy (40.91%) and perceived efficacy of the scheme (14.55%) as the main barriers to our results-based AES acceptance. Although none indicated the financial risk associated with the scheme as a reason to not be willing to enrol, those who stated their reason under the "*Other*" option (17.27%) expressed concerns such as: "*It implies paying a consultant, and dedicating time to the measurement to maybe obtain a contribution, typically of the modest amount"*; or "*The effort required to achieve the results is not compensated by the awarded prize*"; or "*I am not sure whether I will get the payment*". Thus, we assume that another important factor negatively influencing the adoption of our scheme is financial risk.

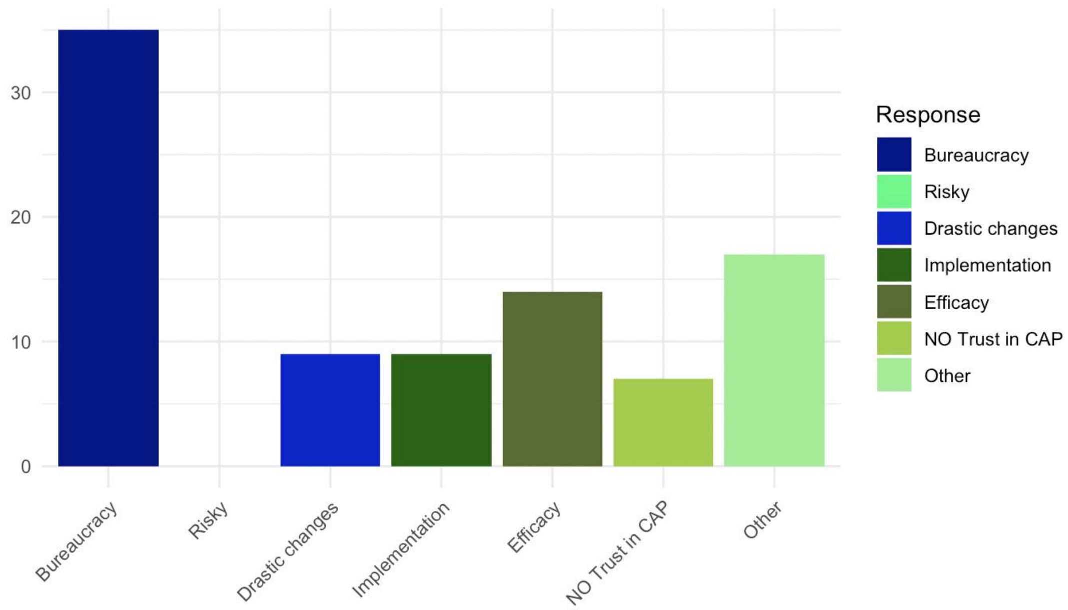

Figure 5. Reasons for no acceptance

5. Discussion

5.1 Acceptance of the scheme

The first aim of this study concerned the acceptance of our hypothetical results-based measure. Results show that 70.7% of participants are willing to enrol. This rate is in line with the survey conducted in England by Schroeder et al. (2013), who found that 72% of participants would enrol in an RBPS aimed at enhancing species richness in grassland. Similar results were observed by Massfeller et al. (2022) in their contingent valuation study: 60% of the German participants accepted the hypothetical outcome-based AES aimed at pollinators and birds' conservation in intensive arable farming. Tanaka et al. (2022), in their discrete choice experiment conducted in Japan, also draw the conclusion that farmers are willing to participate in this kind of payment system.

The present study has been the first to examine the impact of a rare-species bonus, as an experimental treatment, on both the acceptance and intensity of participation within a results-based agri-environmental scheme. The bonus was intended to incentivize winegrowers to a greater environmental commitment. While the estimated coefficient in the acceptance equation exhibits no statistical significance, it displays a positive impact on the intensity of participation among those who stated acceptance. This suggests that the bonus payment has not been a primary driving factor in the participants' decision-making process. One reason could be that the annual reward of 30€/ha for the rare species was considered too low by those who would have stated non-acceptance regardless. Schroeder et al. (2013) found that, in the context of a results-based AES, the higher the rarity of the indicator species, the higher the risk, and farmers in their survey stated they would accept such a higher risk only if rewarded accordingly. Conversely, participants concerned with environmental issues may have stated acceptance even without the bonus because their decisions could have been mainly driven by their intrinsic values and commitment rather than other extrinsic values, such as reward. While here we presented only the 30€/ha/year bonus, varying the bonus payments is a promising route for future research. In addition to economic factors, farmers' individual characteristics, intrinsic values and cultural background play a significant role in their decision-making (Garforth et al., 2006). Furthermore, the positive effect of the treatment on the intensity of participation implies that, once participants state their willingness to adopt the scheme, the provision of a possible bonus payment increases the percentage of land they would enrol. This could suggest that those who accept the measure have already a strong environmental concern. Thus, potentially receiving an additional bonus for a rare species may have further strengthened their sense of social and environmental responsibility towards endangered species.

We found that participants who already had adopted an AES in the past (65.7% of the sample), and thus have knowledge about its functioning, are more likely to enrol in our hypothetical scheme. This is consistent with the literature. Sumrada et al. (2022) show that having previously been enrolled in such programs positively relates to Slovenian farmers' acceptance of their hypothetical scheme for dry grassland conservation. Schroeder et al. (2013), Sumrada et al. (2022) and Massfeller et al. (2022) also found the same relationship. However, given the high percentage of participants who had already been enrolled in an AES in our sample, it is plausible that there has been a self-selection of farmers with previous experience. Hence, the real acceptance rate may be lower than our study suggests.

Our findings show another factor correlated to the probability of accepting the scheme is gender, with women exhibiting a greater propensity to enrol than men. This is not consistent with the findings of Sumrada et al. (2022), whose results show the opposite. However, it still makes sense if we see women as more attuned to nature. Since the early 1980s, women have been perceived as more responsible for nature's care and conservation compared to men (Meinzen-Dick et al., 2006). Therefore, it may be the case that female winegrowers in our sample were more concerned with pollinators' safeguards and thus were more willing to participate in our hypothetical scenario.

Regarding behavioral factors, signalling, perceived control and perceived risk were found to have a statistically significant impact on the scheme's acceptance. First, this means that farmers who are more concerned with showing society their environmental commitment are more willing to enrol in our scheme. This aligns with Defrancesco et al. (2008) and Mzoughi (2011) who found that farmers who value their image as a farmer to society are more likely to adopt sustainable farming practices. Secondly, participants who think they would easily achieve the prescribed environmental results are more likely to accept. This aligns with the literature. Canessa et al. (2023), in their investigation of how farm-level ecological conditions influence farmers' preferences for alternative payment schemes, found that decision-making is highly affected by the perceived achievability of the outcome. Furthermore, results show that risk-seeking farmers are more likely to enrol in the scheme. This is also in line with the negative relationship between the perceived risk of the scheme and its acceptance, as well as with the risk-related reasons non-accepters stated in the survey. All these findings, apart from being consistent with each other, are also aligned with those of Massfeller et al. (2022) and Chaplin et al. (2021), where farmers expressed concerns about non-payments in case of the scheme objectives' failure. The uncertainty of the reward system was also pointed out by Tanaka et al. (2022), Russi et al. (2016) and Schroeder et al. (2013) as a barrier to participation in outcome-based contracts. As RBPS offers no steady source of income compared to action-based (Burton & Schwarz, 2013), one way to reduce risk-related issues may be the establishment of hybrid payment schemes. Such schemes imply payments partly dependent on results and partly on taking prescribed actions. They thus consider both budgetary and environmental effectiveness, while offering farmers a lower financial risk opportunity to test results-based payments (OECD, 2022). However, hybrid payments may also result in less ecological outputs as well as in greater administrative burden for both farmers and scheme assessors, as pointed out by Herzon et al. (2018). Another solution could also be establishing a pure results-based system with a very low threshold in the first year of the scheme gradually increasing in the following years. In this way, farmers may be more incentivized to enroll because of the lower financial risk and the greater chance to achieve ecological achievements in the first year. Furthermore, this solution may allow farmers to familiarize with the results-based payment scheme in the transition phase and thus adapt their agronomical practices to achieve higher environmental goals in the following years. Finally, it may also enhance farmers' perceived control of the measure and thus increase the participation rate.

The greatest barrier to our results-based AES, as indicated by farmers in the survey, is the perceived bureaucratic burden. This not only aligns with results from papers examining the perception of RBPS (Massfeller et al., 2022; Tanaka et al., 2022) but also with studies analyzing the determinants of farmers' acceptance of action-based AES (Cheze et al., 2020; Pe'er et al., 2018; Defrancesco et al., 2008). This suggests that the agri-environmental schemes' administrative framework is commonly perceived as a burden, independent of whether the payment system is results-based or action-based.

5.2 Intensity of participation

The second aim of this thesis was to identify the factors affecting the intensity of participation among those who stated acceptance. We formulated the hypothesis that the higher the payment offered the higher the percentage of land participants would enrol in our scheme. Results verify this as also shown in Figure 4. As expected, the indicated percentage of land participants would enrol increases as bids offered get higher.

Our results also give insights into how participants in different age groups (21-29; 30-39; 40-49; 50-59; 60+) are related to the intensity of participation. Since the age groups were included as dummies, the reference category chosen for the analysis was the highest (60+). All the variables (except for the one indicating the group 21-29) exhibit a positive sign of the estimated coefficients and are significant at the statistical level. This means that younger participants are more inclined to enrol a greater share of their land in our program compared to the oldest ones. Similar results were also obtained by Sumrada et al. (2022). However, it is worth noticing that, among all the age groups, participants within the 50-59 group show the greatest increase in the indicated percentage compared to the reference category (by 14.17 percentage points). This finding indicates these participants seem to be more interested in our scheme, potentially reflecting a greater interest in sustainable agriculture and climate policies from this age group. Policymakers could design policies that also incentivize youngsters, given their pivotal role in promoting more sustainable agriculture in the future.

Although following organic viticulture did not exhibit a statistically significant effect on the probability of accepting our scheme, it seems to be negatively correlated to the intensity of participation. One possible explanation could be that farmers who are already receiving premium prices for the organic certification, compared to those who are not benefitting from the same compensation, are not so interested in being awarded our payment schemes. However, we must be careful when discussing this result because there is a high chance of self-selection bias in our sample. More than 50% of participants in this experiment follow organic agricultural practices, for all or part of their farm, including those in transition. However, the average national organic vineyard area in Italy is 21%. This skew toward organic farmers indicates winegrowers in the population would be willing to enrol in even higher percentages of land and thus that the demanded compensation would be lower than the one estimated in our study.

Behavioral factors relating to the intensity of participation are signalling, perceived control and financial benefit. Once participants stated acceptance, signalling was still a driving factor in choosing the percentage of land enrollment in the scheme. This is probably because farmers who are concerned with their public image also believe this would be further improved if they enrol a higher percentage of vineyards. Concerning perceived control, its positive correlation with participation intensity implies that farmers who think to have the right instruments and knowledge to reach the set environmental objective are more inclined to enrol higher percentages in the program. This reasoning is further supported by the positive effect of a greater perceived financial benefit from the scheme. The more winegrowers believe this measure will result in higher returns and the less they are concerned with the greater effort required to reach the threshold, the higher the percentage of land they want to subscribe to.

Lastly, we also tested the presence of the anchoring effect (or starting point bias). This phenomenon – which is the influence of the initial bid on the participant's subsequent bids – is common in contingent valuation studies (see van Exel et al., 2006; Holmes & Kramer, 1995; Boyle et al., 1985). To check for the bias, we employed three different starting points (low, medium, and high) for the bid vectors, that have been randomly assigned to participants. Consistently with other studies (Chien et al., 2005), results indicate anchoring is present as the signs of the estimated coefficients for level 2 and level 3 of the payments are negative. This indicates that higher initial payment values resulted in higher expected payment thresholds. Participants, when exposed to higher bids, were influenced by the starting point. To provide a more comprehensive understanding of the extent of the anchoring, we calculated the minimum payment required to prompt participants to enrol an average of 50% of their land for each payment level. Under level 1, this minimum is 199.72€/ha. The minimum under level 2 is 225.65 €/ha, while under level 3 is 345.10€/ha. A more comprehensive table is in Appendix C. Notably, the minimum payment to get an average of 50% of land enrolled in the program is progressively higher, meaning that participants have been anchored to the initial bids. Participants exposed to level 3 demanded a relatively higher payment to consider enrolling in our scheme. This estimated payment of 345.10€/ha offers insights into the magnitude of the payment the government would need to provide to enhance farmers' participation.

6. Conclusions

This thesis has sought to analyse the determinants of Italian winegrowers' willingness to accept a hypothetical results-based agri-environmental scheme, as well as how different payments and other factors related to the intensity of participation (measured in terms of the percentage of land farmers are willing to enrol). We sent an online contingent valuation survey to Italian winegrowers and collected 222 complete responses. Although we did not detect any influence of a rare-species bonus on the acceptance of our scheme within the treated group, the same bonus increased the intensity of participation among those who stated acceptance. Risk-averse farmers were found to be less likely to enrol in our hypothetical scenario, while we found that behavioral factors, such as the perceived risk and control of the scheme, not only influence acceptance but also participation intensity. Lastly, results show that higher payments result in higher percentages of land that farmers would enrol in the scheme. We also found starting point bias was present and, taking this bias into account, governments should reward farmers with at least 345.10€/ha to make them participate in the hypothetical results-based AES with an average of 50% of their land.

The study has some limitations. The sample, although quite wide and representative of most criteria (size, regions), is a convenience sample. Furthermore, it is over-representative of organic farms. In combination with the topic of the survey, this may have caused self-selection bias. Therefore, results from this study should be carefully interpreted and future research is needed to reach a more representative sample of the Italian winegrowers' population. Another limitation of the thesis is the use of the CV method. A similar study employing a discrete choice experiment may be conducted in the future to check whether Italian winegrowers would prefer results-based even when compared to outcome-based contracts (as already done by Sumrada et al., 2022).

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Appendix 1

The survey used to collect data is findable via the following link:

https://drive.google.com/file/d/1bgkLrpvheQze8kDekmTYyX_yluVEz0L8/view?usp=sharing

Appendix 2

Table 9. Results of the Tobit model

	Estimate	(SE)
Payment	0.45***	(0.03)
Payment Level 2	-18.28**	(8.13)
Payment Level 3	-72.21***	(9.01)
Treatment (bonus for rare species)	12.87**	(6.47)
Age 21-29	20.91*	(12.66)
Age 30-39	23.07**	(10.73)
Age 40-49	29.56***	(9.92)
Age 50-59	39.95***	(10.55)
Size 0-5	5.09	(12.36)
Size 5-10	6.03	(11.45)
Size 10-20	10.31	(11.30)
Size 20-50	-0.31	(12.95)
Signalling	12.99**	(5.79)
Organic	-19.01**	(7.65)
Viticulture as main source of income	1.13	(7.49)
Perceived control	12.66***	(3.92)
Perceived risk	5.11	(4.24)
Environmental benefit	3.74***	(6.84)
Financial benefit	28.08	(7.26)
Environmental concern	4.06	(4.71)

Significance levels: *p < 0.1; **p < 0.05; ***p < 0.01

Appendix 3

Table 10. Money required to get an average of 50% of enrolment under the different bid vectors

Level	Payment	Percentage (mean)	Min. of money required
1	70	23.05	199.72
1	110	31.40	199.72
1	180	45.18	199.72
1	250	62.26	199.72
1	330	75.79	199.72
2	110	27.82	225.65
2	180	36.95	225.65
2	250	56.95	225.65
2	330	73.69	225.65
2	410	88.69	225.65
3	180	29.58	345.10
3	250	33.57	345.10
3	330	46.51	345.10
3	410	64.96	345.10
3	500	85.53	345.10

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