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Wine growers' propensity to adopt digital precision farming technologies: integrating risk attitudes to the Technology Acceptance Model[☆]

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ABSTRACT

The objective of this study is to explore the propensity of wine growers to implement precision agriculture technologies in their core business. The investigation will focus on the main cognitive, social and risk factors affecting this intention. The Technology Acceptance Model, TAM2, integrated with risk attitudes was adopted. Data were collected from 128 Sicilian wine producers using a questionnaire, following which the PLS-SEM was employed for analysis. The findings reveal that Perceived usefulness and Ease of use of innovative technologies are the most influential factors in the decision-making process. Nevertheless, farmers' risk attitudes have been shown to significantly influence their decisions about adopting Precision Agriculture Technologies. Despite the potential benefits, farmers who are risk-averse demonstrate a greater reluctance. Additional barriers include high costs, lack of training and compatibility with traditional practices. This study enhances the existing literature by offering insights into the key factors influencing farmers' intention to implement PATs. Moreover, the findings offer significant insights for wine businesses and policymakers, underscoring the efficacy of targeted training programmes, risk mitigation strategies, and financial incentives in expediting the digital transformation of the viticulture sector. More in detail, the results allow wineries to understand the main barriers to innovation in the management of their businesses. This understanding enables them to define targeted strategies. Secondly, the results can guide the definition of policy measures with the potential to effect meaningful change in the wine sector, with a view to economic and environmental sustainability. The study contributes to the sustainable future of the agricultural industry by reducing the digital divide, enhancing productivity and environmental efficiency, and improving market competitiveness.

1. Introduction

In recent decades, the global population has increased, resulting in greater demand for food, the need to reduce the environmental impact of manufacturing processes, which are often the result of the mismanagement of resources, and the climate change issue, which have led farmers to pursue innovative and sustainable solutions (Parra-López et al., 2024). The process of agricultural innovation involves moving beyond conventional practices by using new technologies to optimise resource use and improve productivity (Tahir et al., 2023). Precision agriculture technologies (PATs), among the most widespread innovations, encompass the adoption of a variety of tools, including sensors, global positioning systems (GPS), unmanned aerial vehicles (UAV), farm management software and data analysis, which can improve

resources management. The existing literature in this research area has investigated a number of different aspects, including those related to the economic viability of PATs (Sofia et al., 2025; Pánková et al., 2020), the reduction of environmental pollution resulting from a more sustainable and efficient resource management (Sharma, 2023), the measures adopted with a view to promoting the adoption of these emerging technologies (Huber et al., 2023) and, to a lesser extent, the decisions related to their adoption (Gabriel and Gandorfer, 2023). The latter aspect assumes a relevant importance as, despite PATs provide considerable value and potential, prior research has highlighted limited uptake and infrequent use of these technologies by farmers (Long et al., 2016; Blasch et al., 2022). A substantial body of research has previously been dedicated to identifying the factors that influence the adoption of PATs, particularly in relation to farm characteristics (size, sales, industry or

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land tenure) (Barnes et al., 2019; Blasch et al., 2022; Groher et al., 2020), the demographic and socio-economic traits of farmers (age, education, experience, cost-effectiveness) (Michels et al., 2020) and rarely extends beyond the individual dimension of farmers (Pathak et al., 2019). Consequently, there has been a paucity of studies that have moved beyond the study of directly observable variables to the study of latent variables (farmer beliefs, attitudes, perceptions, etc.) that affect farmers' intention to adopt innovations (Hrynevych et al., 2022; Kakkavou et al., 2024).

A wide range of theoretical models have been used in an attempt to explain the way people make decisions about adopting innovative technologies, including PATs, most of them are based on the Ajzen's Theory of Planned Behaviour (TPB) (Ajzen, 1991), on the Roger's Theory of diffusion innovation (TDI) (Mawusi et al., 2020) and the Davis and colleagues' Technology acceptance model (TAM) (Yang et al., 2022; Li et al., 2023; Mohr and Kühl, 2021). Among these theories, TAM is particularly well suited to explaining why farmers accept or reject a particular type of precision farming technology, and how farmers may be influenced by the features of the technology. In other words, It serves as a theoretical basis for investigating how external factors shape farmers' internal cognitive structures, including their beliefs, attitudes, and intentions. The hypothesis advanced here is that perceived ease of use (PEOU) and perceived usefulness (PU) are the two key determinants in providing the most robust explanation of farmers' intention to adopt an innovation (Castiblanco Jimenez et al., 2020; Hrynevych et al., 2022). For instance, Michels et al. (2021) demonstrated that PU and PEOU significantly shape German farmers' attitudes toward drone adoption, particularly when the technology is easy to use and provides valuable outcomes. By contrast, the results reported by Caffaro et al. (2020) and Mohr and Kühl (2021) indicate that Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) may have a relatively limited impact on the adoption of precision farming technologies. This is attributed to the perception that external factors, such as market access and the paucity of AI systems available on the market, are deemed to be more significant. In some studies, the traditional TAM model was expanded by considering other constructs, different from PU e PEOU, which have been identified as key determinants of farmers' adoption. For example, Rosli et al. (2022) demonstrated that factors such as 'output quality' and 'job relevance'—despite having received comparatively limited attention in the literature— contribute notably to shaping the adoption of PATs. For their part, Canavari et al. (2021) highlighted output quality as a key determinant positively affecting the intention to adopt Variable Rate Irrigation (VRI) while Michels et al. (2021) identified job relevance as a robust predictor of perceived usefulness of drones as, the greater is the support of the drone in different agricultural operations, the greater will be the usefulness and, thus, the intention to use it. Although various determinants have been employed to explain farmers' adoption of technological innovations, the literature has devoted limited attention to the role that risk attitudes may play in shaping their decision-making processes. Several studies have shown that risk-averse attitudes among farmers negatively affect the adoption of precision agriculture technologies (Musyoki et al., 2022; Dadzie et al., 2022; Kakkavou et al., 2024). Conversely, other studies have found that farmers with a greater propensity for risk-taking are more inclined to adopt sustainable innovations (Sofia et al., 2025). Nevertheless, as far as we are aware, no studies to date have explored the interaction that farmers' risk attitudes may have with the other constructs of the TAM in explaining the decision-making process behind the adoption of technological innovations among farmers.

The purpose of the present study is to address this lacuna by conducting a thorough investigation on the wine growers' propensity to implement PATs in the core business and the main cognitive, social and risk factors affecting this intention. In essence, an adaptation of the TAM-2 (Venkatesh and Davis, 2000) has been utilised as a reliable instrument to elucidate the technology adoption decision-making process among farmers. To reach this aim, a study was carried out among grape

growers' in Sicily, a Southern Italian region. Sicily region was chosen for two specific reasons. The first reason is linked to the low degree of digitisation of companies in the agricultural sector. The data from the 7th General Census of Agriculture (ISTAT, 2021) highlighted that of the more than 1.1 million farms surveyed in Italy, only about 179,000 of these are digitised, of which only 12.3 % concerns agricultural woodlands, including wine-growing companies. The distribution of these farms is heterogeneous along the peninsula, with the Southern regions of the country exhibiting low levels of digitisation. More specifically, regarding Sicily, only 7.5 % of the regional total number of farms have been digitized (ISTAT, 2021; Gnesi et al., 2022). A second reason is the importance of Sicilian viticulture in the Italian panorama. It is evident that Sicily plays a substantial role in the Italian viticultural sector, accounting for 15 % of the national vineyard area and 8 % of the country's aggregate wine production (Unicredit-Nomisma, 2022; Nomisma-Wine Monitor, 2023).

This research advances the literature on precision technology adoption through an examination of the principal factors influencing farmers' decision-making processes, particularly in contexts with low levels of digitalization. In addition, it has significant implications on the management and policy areas. The survey, which was conducted with the involvement of the main stakeholders in the wine sector (i.e. the wine growers), identified the main cognitive, social and risk-related factors driving the decision-making process. This in turn allowed the strategic solutions to be identified that would overcome the main barriers that had been identified. Increasing winegrowers' confidence in precision technologies and their economic and environmental potential is essential to overcome scepticism and drive real impact through business model change. In this respect guiding the design of training programs, economic incentives and awareness strategies represent some of the tools which can accelerate technology adoption. Furthermore, the study aligns with the principles of real impact articles, assessing the transformative potential of PATs in business processes, human resource management, sustainability and market positioning.

2. Theoretical framework and hypotheses

Fig. 1 depicts the proposed conceptual model, which includes the TAM2 variables along with risk perception factors. The TAM2, designed by Venkatesh and Davis (2000), is an updated version of the original TAM model (Davis, 1989) and is developed with the aim of analysing and predicting technology acceptance and adoption in more depth by including new social (Subjective Norms, Image and Voluntariness) and cognitive (Output Quality; Job Relevance and Result Demonstrability) variables that represent the social influence mechanism and the cognitive instrumental mechanism, respectively, affecting the perceived usefulness and intention to use technology. Beyond the traditional theoretical constructs, the adopted conceptual framework integrates risk attitude, articulated through the dimensions of risk perception and risk tolerance, as an additional factor affecting perceived ease of use and the intention to use technology.

Several studies using TAM as a theoretical model reveal that the adoption process of innovative tools, like precision agriculture technologies, is affected by subjective norms (Li et al., 2023; Uehleke et al., 2024). Ham and colleagues define subjective norms as "individual's perception of social pressure from other who are important to them" (Ham et al., 2015, p. 5). The decision to use precision technologies in agriculture, including Autonomous Fields Robot (von Veltheim and Heise, 2020), or Apps for crop protection (Michels et al., 2020), is significantly influenced by the opinions of colleagues and superiors. This is particularly salient for farmers who are members of rural communities, for whom external expectations play a crucial role in the process of decision-making (Kuczera, 2006). Consistent with this, Hüttel et al. (2022) identified the factor 'subjective norms' as the primary predictor in shaping farmers' decisions to adopt variable-rate nitrogen application in agriculture. This factor was represented by progressive peers and

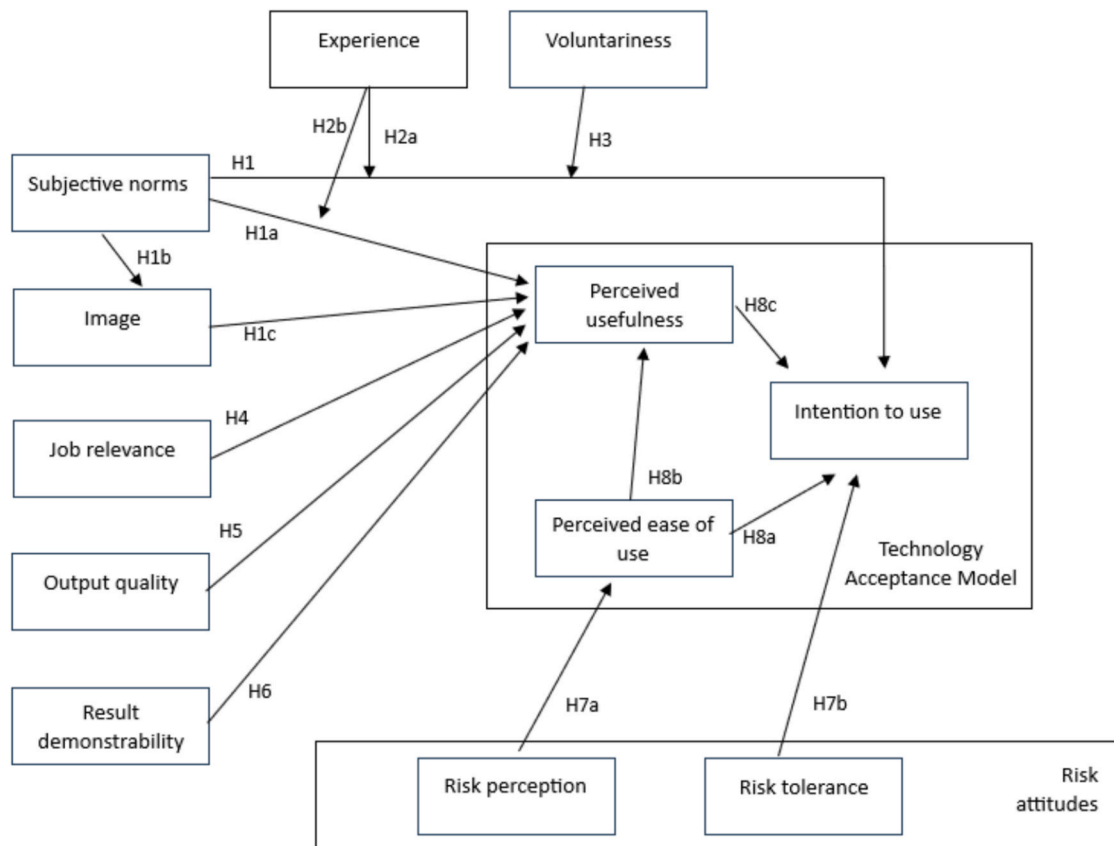


Fig. 1. Conceptual framework.

those already utilising forms of precision technologies. The research was conducted within the framework of assessing intentions to adopt and implement sustainable digital fertilization practices. In consideration of the aforementioned points, the present study proposes the following hypothesis:

H1: Subjective norms affect the intention to use precision technologies in viticulture.

Unlike the direct effect of subjective norms on behavioral intention posited by the Theory of Reasoned Action (TRA) and the Theory of Planned Behavior (TPB), the Technology Acceptance Model 2 (TAM2) proposes that this influence is indirect, operating through perceived usefulness and image via the processes of internalization and identification. Internalization, as described by [Kelman \(1958, p.53\)](#), is a phenomenon that “occurs when an individual accepts influence because the content of the induced behavior – the ideas and actions of which it is composed – is intrinsically rewarding”. In accordance with the aforementioned points, [Moura et al. \(2020\)](#) discovered a correlation between subjective norms and perceived usefulness, as well as a mediating effect of the latter on the intention to utilise an innovation. The findings of this study reveal that when superiors or colleagues recommend a technology as useful, it leads the potential user to believe in their value, increasing their intention to use them. Furthermore, [Venkatesh and Davis \(2000\)](#) posit that users adopt innovative technologies to enhance their perceived social status or identity, thereby improving their image. In their seminal work, [Moore and Banbasat \(1991, p. 195\)](#) provide the following definition of the concept of ‘image’ as “the degree to which use of an innovation is perceived to enhance one’s... status in one’s social system”. This result corroborates the findings of [Rejón-Guardia et al. \(2020\)](#), which showed that social influence has a direct impact on how others perceive the user, consequently elevating the user’s social image. As a result, perceived usefulness is positively affected, given that

the adoption of a highly regarded technology reinforces its value perception. Furthermore, [Alwabel and Zeng \(2021\)](#) observed that the adoption of specific technologies fosters a sense of group belonging among individuals, which in turn positively affects their perceived social status, as such technologies are highly esteemed within the group. As a result, the following hypotheses are proposed:

H1a: Subjective norms affect the perceived usefulness;

H1b: Subjective norms affect the company image;

H1c: Image affects the perceived usefulness.

Nonetheless, as users become increasingly acquainted with the innovation, the effect of societal influence on their intention to adopt the technology diminishes over time ([Hartwick and Barki, 1994](#)). [Hannus and Sauer \(2021\)](#) also highlighted the critical role of experience in the adoption of sustainable management standards in agriculture, showing that farmers’ experience shapes their perceptions of usefulness and, in turn, their intention to adopt these standards. Because of limited knowledge, users initially depend on peer opinions to guide their decision to adopt the technology. However, as they become more familiar with the technology and gain direct experience of using it, this reliance diminishes. Consistent with these findings, [Masi et al. \(2022\)](#) highlighted experience—conceptualized within the broader framework of knowledge—as a key determinant in encouraging the uptake of precision technologies in agriculture, especially in accelerating the shift towards sustainable farming practices. Furthermore, this is consistent with [Canavari et al. \(2021\)](#) study where experience has a moderating effect on the influence of subjective norms on the intention to adopt. Variable Rate Irrigation technology, reducing their influential effect. Based on this study explores the following hypotheses:

H2a: Experience acts as a moderator in the relationship between subjective norms and the intention to adopt precision viticulture technologies;

H2b: Experience moderates the effect of subjective norms on perceived usefulness of precision viticulture technologies.

The literature on innovation and precision technology adoption indicates that the intention to adopt innovations is influenced by voluntariness, conceptualized by [Beauchamp and Childress \(2009, p. 132\)](#) as a person acting “if he or she wills the action without being under the control of another’s influence”. [Hartwick and Barki \(1994\)](#) discovered that dividing users into groups based on whether information system usage was mandatory or voluntary revealed that subjective norms primarily affected the intention to adopt the information system (e.g. information technology system, decision support systems, ecc.) especially in mandatory situations. In light of this, [Venkatesh and Davis \(2000\)](#) theorize and prove that the same moderating effect of voluntariness in subjective norms–intention relationship is applicable to the adoption of technological innovations domain. In line with these findings, [Aubert et al. \(2012\)](#) demonstrated that a diminished sense of voluntariness among farmers adversely affects their adoption of precision technologies, indicating that external pressures influence the decision-making process. This moderating effect was confirmed in [Canavari et al.’s \(2021\)](#) study, in which voluntariness emerged as a key factor in mitigating the influence of subjective norms on the decision-making process and the intention to adopt variable rate irrigation technology. The following hypothesis is hereby proposed, based on the information provided:

H3: The effects of subjective norms on the intention to use precision viticulture technologies are moderated by voluntariness.

To improve the predictive power of the TAM2 model, [Venkatesh and Davis \(2000\)](#) introduced the construct of job relevance, defined as follows ([Venkatesh and Davis, 2000, p. 191](#)): “*an individual’s perception regarding the degree to which the target system is applicable to his or her job*”. Several pieces of empirical evidence demonstrate that job relevance has a direct impact on the perceived usefulness of innovative technologies ([Bröhl et al., 2019](#); [Travaglini et al., 2023](#)). In line with this, [Michels et al. \(2021\)](#) demonstrated that the job relevance of drones in agricultural contexts significantly influences perceived usefulness; the greater the extent to which drones assist in diverse farming tasks, the higher the perceived usefulness and, in turn, the intention to use them. Similarly, [Hrynevych et al. \(2022\)](#) deepened the analysis of the job relevance–perceived usefulness relationship within agricultural cooperatives, showing how job relevance indirectly favours a greater intention to adopt smart farming technologies through an increase in perceived usefulness. Results show how the cooperative members place a higher value on precision technologies when it is acknowledged for its versatility. The following hypothesis is proposed as a result:

H4: Job relevance of precision viticulture technologies affects their perceived usefulness.

Several studies have shown the importance of the output quality in influencing the perceived usefulness of a technology and subsequently favouring its intention to use. [Khoza et al. \(2021\)](#) found that farmers were more likely to adopt smart agricultural technologies if they saw them as a useful way of completing tasks effectively. In other words, if the outcome is in line with farmers’ expectations and the possibility of meeting specific needs, this information encourages the adoption of innovative solutions. ([Castiblanco Jimenez et al., 2020](#)). Similar results were obtained by [Boubker \(2024\)](#) that showed how AI-based systems are more valued and widely used by users when they produce high-quality information output, leading to increased satisfaction. Ultimately, the more an individual considers a system to be capable of performing certain task with high performance, the more useful he or she will perceive it to be in the use of this. In light of this study explores the following hypothesis:

H5: Output quality of precision viticulture technologies affects their Perceived usefulness.

Furthermore, empirical studies suggest that the demonstrability of results, which [Moore and Benbasat \(1991, p. 203\)](#) define as the “tangibility of the results of using the innovation, plays a significant role in

shaping the adoption of new technologies,”. [Sayruamyat and Nadee \(2019\)](#) and [Soodan et al. \(2024\)](#) findings highlight that results demonstrability is an important predictor in influencing the intention to use AgriMap and Agro-advisory mobile applications, respectively, through an increase in their perceived usefulness. [Khoza et al. \(2021\)](#) found comparable results, showing that farmers in developing regions are more likely to adopt climate-smart technologies when clear benefits and tangible evidence of effectiveness are demonstrated. In particular, [Saari et al. \(2022\)](#) confirm that result demonstrability influences the adoption of robots, particularly among early adopters who believe that clearly seeing the results of using the technology is essential. In the light of this, the following hypothesis is proposed:

H6: Result demonstrability derived from the use of precision viticulture technologies affects their perceived usefulness.

Extensive research demonstrates that farmers’ risk perception is a crucial factor influencing their decision-making regarding the adoption of precision technologies. This perception affects their inclination to adopt or reject this technology, depending on their individual risk profile (risk-averse, risk-neutral and risk-lover/risk seeking) ([Liu et al., 2023](#); [Musyoki et al., 2022](#)). This is also explained as a consequence of continuous exposure to market risks (price changes, market demand), production risks (loss of yield), and policy risks (financing, changes in strategies) ([Nastis et al., 2019](#)). The way people think about risk is usually split into two parts. The first part is called “risk perception”. This is when a producer decides how risky an investment is. This can be anything from thinking there is no risk at all, to thinking there is a lot of risk ([Pennings and Wansink, 2004](#)). The second part is “risk tolerance”. This is when a producer decides how much financial risk they are willing to take ([Hoffmann et al., 2013](#)). The intention to use a given technology is affected by both factors, either directly or indirectly. In their study, [Hannus and Sauer \(2021\)](#) found that risk perception negatively impacts the perceived ease of use, thereby discouraging technology adoption. Conversely, studies by [Kakkavou et al. \(2024\)](#) and [Dadzie et al. \(2022\)](#) highlight the importance of risk tolerance. The findings suggest that farmers who exhibit a strong risk-averse attitude are more likely to resist adopting new technologies, mainly because of their inherent cautiousness. In contrast, individuals who are optimistic and inclined to take risks are more open to embracing new technology, even if it requires a high investment. In the light of this discussion, this study explores the following hypotheses:

H7a: Farmers’ risk perception on investing in precision viticulture technologies influences their perceived ease of use of these.

H7b: Farmers’ risk tolerance affects their intention to use precision viticulture technologies.

Recent empirical studies show that the adoption and intended use of precision agriculture technologies are largely shaped by users’ perceptions of their usefulness and ease of use ([Michels et al., 2021](#); [Giua et al., 2022](#)). In their study on technology adoption in agriculture, [Zheng et al. \(2019\)](#) provided evidence of a significant direct influence of perceived ease of use on Chinese farmers’ intention to adopt UAVs, emphasising the importance of simplicity in UAV systems to encourage their adoption in agriculture, [Michels et al. \(2020\)](#) showed the same significant influence, both directly and through perceived usefulness. They also underlined the importance of flexibility to favour adoption of precision technology. [Nguyen et al. \(2024\)](#) instead highlighted the central role of the perceived usefulness factor in fostering the intention to use precision technologies to implement cleaner production practices, with farmers who tend to focus on the potential benefits rather than the investment cost.. In light of this, the following hypotheses are proposed:

H8a: Perceived ease of use of precision viticulture technologies impacts the intention to use them;

H8b: Perceived ease of use of precision viticulture technologies affects how useful they are perceived to be;

H9: Perceived usefulness of precision viticulture technologies influences the intention to use them.

3. Methodology

3.1. Data collection and questionnaire structure

This study seeks to investigate the key factors that influence winegrowers' adoption of precision technologies, with the objective of identifying strategies and policy measures to support the digital transition of the sector. The choice of Sicily as a study area was motivated by three main factors: (i) the low level of digitalisation of the regional agricultural sector, with only 7.5 % of Sicilian farms using digital technologies (ISTAT, 2021); (ii) the economic relevance of Sicilian viticulture, which accounts for 15 % of the national area under vines and 8 % of the total production of wine in Italy (Unicredit-Nomisma, 2022); and (iii) the strong propensity of Italian wineries to invest, especially in technological innovation (ISMEA, 2024).

A multi-stage approach was used in the methodological design to ensure a structured and rigorous process of data collection, analysis and interpretation. To ensure a random distribution, an extensive list of Sicilian wineries was used, compiled by cross-referencing various databases and involving the main sector associations operating in the region. The involvement of industry associations and local agricultural organizations was also valuable in stimulating the engagement of participants. In a second step, all interested winemakers were contacted and a questionnaire was sent to them. The survey was distributed through an online platform in June and July 2024 and the data collection phase was carefully monitored to ensure a balanced representation of different types of winegrowers, considering farm size, production methods, and technological adoption levels. The questionnaire specifically designed for the study was prepared by the researchers involved in the study based on the conceptual model developed and, before being sent to the winegrowers, it was shared with academics, industry professionals, agricultural consultants, representatives of trade associations and experts in the wine sector. The pre-testing phase was extremely useful in checking the comprehensibility of the questions in the questionnaire and its completeness in relation to the phenomenon under study. The final version of the questionnaire consists of five sections. Initially, detailed information about the study objectives and informed consent was provided. Winegrower participation was voluntary and unpaid, and each of them agreed that their data would be processed anonymously as required by the Declaration of Helsinki. The first part of the questionnaire collected information on farm and entrepreneur characteristics. Next, a focus was made on precision agriculture technologies. Finally, the psychographic constructs used in the TAM2 and risk attitudes were also explored. This holistic approach provided practical insights for stakeholders, including wineries, policymakers, and agricultural organizations.

3.3. Psychographic variables

Theoretical constructs were selected from previous research using the TAM2. Specifically, the measurement scales for Perceived Usefulness, Perceived Ease of Use, and Intention to Use were adapted from Davis (1989). The construct of Subjective Norms was drawn from the work of Taylor and Todd (1995), while the dimensions of Outcome Demonstrability and Image were based on Moore and Benbasat (1991). Additionally, the measures for Job Relevance and Output Quality were sourced from Davis et al. (1992). In addition, this study included two moderators, namely Experience and Voluntariness, which the literature shows can moderate the effects of Subjective norms on Perceived usefulness and Intention to use an innovation (Hannus and Sauer, 2021; Venkatesh and Davis, 2000). Previous studies (e.g. Canavari et al., 2021; Hannus et al., 2020) confirm that prior experience has a significant impact on the intention to adopt an innovation. Finally, risk attitude, composed of Risk perception and Risk tolerance, was considered to understand its effect on farmers' technology adoption (Pennings and Wansink, 2004; Hoffmann, Post, and Pennings, 2013). It is thought that

if people perceive more risk, they are less likely to adopt sustainable practices, as entrepreneurs will try to minimise their risk exposure. On the other hand, tolerance should increase this intention (Pennings and Wansink, 2004). All the items can be viewed in Table a in the Appendix.

3.4. Sample description

The final sample consists of 128 Italian winegrowers. Since the study is based on a convenience sample, the data may not fully represent the Italian and Sicilian wine sectors; however, this can be useful for providing preliminary insights and stimulating further, more in-depth research. For more details, please refer to Table 1.

3.5. Data analysis

The Structural Equation Model with Partial Least Squares (PLS-SEM) has been used to analyze the conceptual model and its structural paths (Hair et al., 2021; Hair et al., 2019). The PLS-SEM model offers two primary advantages. First, it can effectively accommodate both single-item and multi-item constructs without encountering identification issues. Secondly, it has greater statistical power than the covariance-based model (CB-SEM) (Dash and Paul, 2021). In addition, PLS-SEM is particularly effective with large samples, improving the consistency and precision of estimation (Sultan et al., 2021). The PLS-SEM methodology employed in this study comprises two components: the measurement model and the structural model. The reliability and validity of these models are assessed through a range of established criteria, including Cronbach's alpha and the Fornell-Larcker criterion (Gallagher et al., 2022; Tuncer, 2021). The analysis was conducted using STATA 17 software.

4. Results

4.1. Common method bias

First, Harman's test was used to check for any potential common method bias (Tuncer, 2021). The findings of the investigation demonstrate that a solitary factor elucidates 31.15 percent of the aggregate variance. Although this percentage is significantly less than the 50 % threshold, the common method bias is not dominant and the other factors significantly contribute to the variance of the data. The results of Harman's single-factor test suggest that the risk of common method bias in this study is negligible (Sultan et al., 2021). In addition, the absence of problematic collinearity between constructs was confirmed through variance inflation factors (VIFs). In fact, no VIF value exceeds the threshold of 10, and most values are well below 5 (Gallagher et al., 2022; Tuncer, 2021) (Table b in the Appendix). Therefore, the dataset used for this study is considered free of common method bias.

Table 1
Sample characteristics.

Variables	Description	Values (n = 128)
Age	Mean (± S.D.)	48 (± 12.62)
Sex at birth	Female	21 (16,41 %)
	Male	107 (83,59 %)
Education	Lower-middle level	44 (28,91 %)
	Higher level	84 (71,09 %)
Company area (hectares)	Mean (± S.D.)	3.1–5
Company revenue derived from the vineyard (euros per year)	< 25 000 €	29 (22.66 %)
	25–50 000 €	27 (21.09 %)
	50–75 000 €	15 (11.72 %)
	75–100 000 €	13 (10.16 %)
	>100 000 €	44 (34.38 %)

4.2. Model quality assessment

The relationships between the adopted items and their respective constructs were assessed by examining the factor loadings. The internal consistency of the measured constructs was assessed using composite reliability (CR). Values above 0.7 are considered to be indicative of good internal consistency among the indicators (Table c in the Appendix). Reliability and convergent validity were well indicated by the analysis, since all of the factor loadings of the items were found to be greater than 0.6 (Dash and Paul, 2021; Sultan et al., 2021). Additionally, the fact that all Cronbach’s alpha and rho A values are above 0.7 indicates robust reliability in internal consistency (Hair et al., 2021; Sultan et al., 2021). Furthermore, the average variance extracted (AVE) for all constructs is greater than 0.5 (see Table D in the Appendix), suggesting that they account for over 50 % of the variance in their items (Hair et al., 2021). Discriminant validity is supported by the finding that each construct’s correlations are lower than the square root of its AVE (Fornell and Larcker, 1981). The study’s findings broadly validate the measurement model, thereby reinforcing confidence in the reliability and validity of the constructs used. Furthermore, discriminant validity was assessed using the heterotrait-monotrait ratio (HTMT). Values below 0.85 indicate adequate discriminant validity between constructs (Table d in the Appendix). Finally, to enhance the interpretability of the model, the contribution of each exogenous variable to the explained variance of endogenous constructs was calculated using the product of the correlation between constructs and their corresponding standardized path coefficients. Findings reveal that perceived usefulness (correlation = 0.8363; $\beta = 0.597$; contribution = 0.4992) and Perceived Ease of Use (correlation = 0.7670; $\beta = 0.319$; contribution = 0.2447), are the most significant determinant of the intention to use. Similarly, Perceived Ease of Use (contribution = 0.3849) and Relevance for Work (contribution = 0.2045) emerged as the strongest contributors to Perceived Usefulness. These values further support the theoretical underpinnings of the model and clarify the role of each predictor in shaping users’ behavioural intentions.

4.3. PLS-SEM results

As shown in Fig. 2, the PLS-SEM analysis results indicate that the intention to use precision agriculture technologies is significantly influenced by perceived usefulness and ease of use, which have a positive and substantial impact on this intention. Specifically, Perceived usefulness is strongly correlated with both Intention to use ($\beta = 0.320$, $p < 0.001$) and Perception of ease of use ($\beta = 0.513$, $p < 0.001$), suggesting that a high perception of the usefulness of a product or service is associated with a higher intention to use it. Subjective norms have significant effects on both intention to use ($\beta = 0.002$, $p < 0.010$) and Image ($\beta = 0.416$, $p < 0.001$), indicating that the idea that the community wants sustainable innovations to be adopted affects both Intention to Use and Image ratings. However, norms do not affect perceived usefulness, as do Image and Job relevance. Still, Quality output and Demonstrability of results play an important role in influencing Perceived Usefulness (respectively, $\beta = 0.197$, $p < 0.001$ and $\beta = 0.127$, $p < 0.001$). As for risk attitudes, both Risk tolerance and Risk perception are significant. Perception has a negative weight ($\beta = 0.390$, $p < 0.001$) on Perceived ease of use, while Risk tolerance has a positive weight ($\beta = 0.087$, $p < 0.010$) on it. The findings concerning the two moderators indicate that experience has a moderating effect on the relationship between subjective norms and intention, while voluntariness has a reducing effect on the relationship between subjective norms and intention. The R^2 and Q^2 values obtained for the endogenous constructs are satisfactory, indicating that the model has good explanatory power ($R^2 > 0.60$) and predictive relevance ($Q^2 > 0.25$), in accordance with the recommended methodology for PLS-SEM applications. These results reinforce the validity of the proposed model, demonstrating that the main driving factors are consistent with existing theoretical evidence and significantly contribute to confirming the research hypotheses.

These results confirm and partially verify the hypotheses set out in the study, offering a clear overview of the dynamics between the examined variables. Specifically, the PLS-SEM analysis showed that 12 of the 15 proposed hypotheses were confirmed, as shown in Table 2.

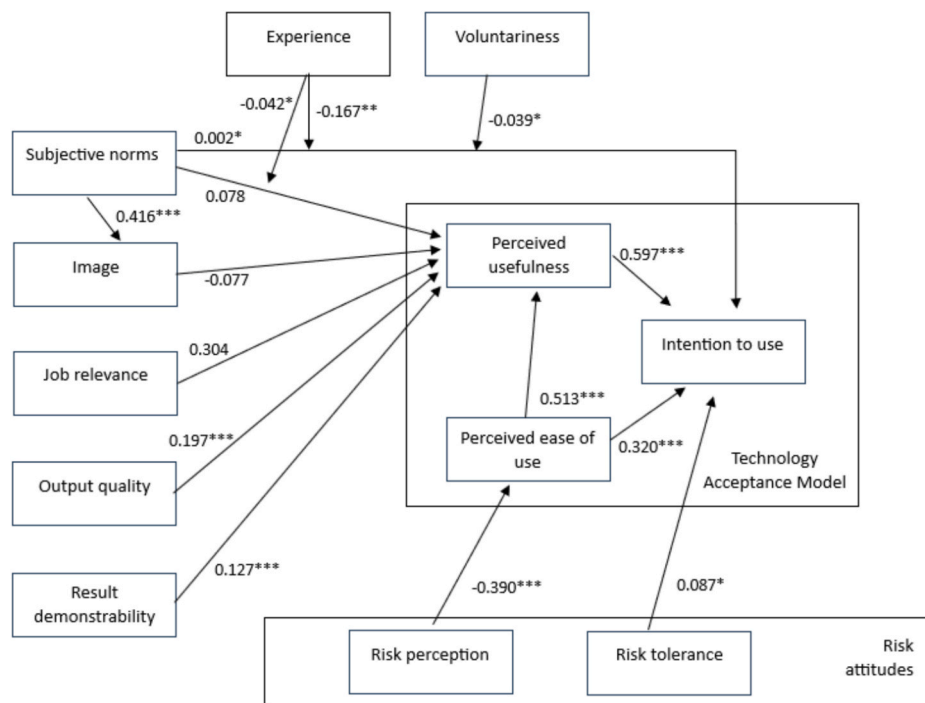


Fig. 2. PLS-SEM results. Perceived Usefulness ($R^2 = 0.739$; $Q^2 = 0.31$), Intention ($R^2 = 0.738$; $Q^2 = 0.29$), and Perceived ease of use ($R^2 = 0.645$; $Q^2 = 0.27$) *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table 2
Hypothesis testing.

Hypothesis	Description	Supported
H1	Subjective norms → Intention to use precision technologies in viticulture	YES
H1a	Subjective norms → Perceived usefulness	NO
H1b	Subjective norms → Company Image	YES
H1c	Image → Perceived usefulness	NO
H2a	Subjective norms → Experience → Intention to use precision viticulture technologies	YES
H2b	Subjective norms → Experience → Perceived usefulness of precision viticulture technologies	YES
H3	Subjective norms → Voluntariness → Intention to use precision viticulture technologies	YES
H4	Job relevance → Perceived usefulness of precision viticulture technologies	NO
H5	Output quality → Perceived usefulness of precision viticulture technologies	YES
H6	Result demonstrability → Perceived usefulness of precision viticulture technologies	YES
H7a	Risk perception → Perceived ease of use of precision viticulture technologies	YES
H7b	Risk tolerance → Intention to use precision viticulture technologies	YES
H8a	Perceived ease of use → Intention to use precision viticulture technologies	YES
H8b	Perceived ease of use → Perceived usefulness of precision viticulture technologies	YES
H9	Perceived usefulness → Intention to use precision viticulture technologies	YES

5. Discussions

It is widely recognised that various factors influence farmers' willingness to adopt innovative technologies. This study aimed to explore the wine growers' intention to adopt precision farming technologies in Sicily, an important viticultural region in the Southern of Italy. An extended version of the Technology Acceptance Model (TAM2) has been adopted and complemented with variables assessing the risks influence on farmer's choices. Understanding the main driving forces of technology adoption in the vine sector is of relevant importance to define targeted and effective measures to foster digital transition in strategic sectors of the agri-food industry.

The study identified a statistically significant association between winegrowers' perceived usefulness of precision technologies and their intention to adopt them. This finding aligns with [Nguyen et al. \(2024\)](#), who showed that farmers' perceptions of the benefits of adopting precision technologies for their work performance significantly influence their adoption intentions. Similarly, [Michels et al. \(2021\)](#) studied the adoption of drone technology in German agriculture and found that if the farmer understands the benefits of the information provided by the technology, he/she is more likely to use it. Additionally, perceived ease of use is found to have a substantial influence on both perceived usefulness and the intention to adopt smart farming technologies. This positive relationship was previously emphasized by [Zheng et al. \(2019\)](#) and [Michels et al. \(2020\)](#), who found that perceived ease of use has both a direct effect on adoption intention and an indirect effect mediated through perceived usefulness. This result confirms the pivotal role of human capital in the process of adopting precision technologies and in particular the specific skills derived from formal agriculture education that increase confidence with these tools and facilitate their implementation in the different stages of the production process ([Kendall et al., 2022](#); [Paxton et al., 2011](#)).

As the literature shows, adopting an innovation in management business processes is often driven by the opinion of peers both in improving the corporate image and on the willingness to adopt a precision farming technology. This study confirms the findings of [Venkatesh and Davis \(2000\)](#) and [Rejon-Guardia et al. \(2020\)](#) that adopting new technologies improves a company's social status and identity, thus

enhancing its social image ([Lee et al., 2006](#)). It also demonstrates a strong positive effect of subjective norms on the development of a more responsible corporate image. Furthermore, peers have a relevant influence in shaping farmers' decision to implement innovative technologies to optimize production processes with a view to safeguarding resources, natural and otherwise ([Hüttel et al., 2022](#); [Albasha and Bartlett, 2024](#); [Pe'er et al., 2020](#)). Through the verbal exchange of information, it is possible to obtain a series of information on the characteristics of the technology, on the skills needed to use it, on the costs and potential benefits that positively influence, together with observations in the field, the adoption of technologies ([Massfeller and Storm, 2024](#)). The role of peer is particularly common among farmers in rural communities, where the opinions of others play a central role in decision-making ([Kuczera, 2006](#)). In line with earlier studies on precision agriculture, experience serves as a moderator that reduces the impact of subjective norms on perceived benefits and adoption intentions of precision technologies. In essence, as farmers become more experienced with these technologies and gain knowledge of their potential benefits, the influence of their peers on their intention to integrate them into their production processes decreases ([Hannus and Sauer, 2021](#); [Masi et al., 2022](#)). Finally, the findings of [Canavari et al. \(2021\)](#) and [Aubert et al. \(2012\)](#) have been confirmed by the results of this study, which show that the effect of social norms on the intention to adopt a technology is influenced by perceived voluntariness, and that in voluntary settings, subjective norms have less influence on technology adoption.

The adoption of precision technology by Sicilian grape growers is also influenced by the expectation that introducing a new technology will improve farm operations and help them to achieve specific objectives by increasing efficiency. In line with the literature, this finding confirms that if the outcome of technology adoption meets farmers' needs, they are more likely to adopt the technology ([Khoza et al., 2021](#); [Castiblanco Jimenez et al., 2020](#)). As [Giua and co-authors \(2022\)](#) point out, farmers' intention to use precision technologies increases when their adoption can ensure higher productivity, cost efficiency and sustainability. Closely related to this result, the data show that respondents are more likely to introduce a precision technology if they have tangible evidence of its benefits. Demonstrability of results has been recognised in several empirical studies as one of the main predictors of perceived usefulness ([Sayruamyat and Nadee, 2019](#); [Soodan et al., 2024](#)), especially among early adopters of these technologies ([Saari et al., 2022](#)). Several studies have also shown that one of the main barriers to adopting precision agriculture technologies is the cost of purchasing and implementing them ([Mohr and Kühn, 2021](#); [Ofori and El-Gayar, 2021](#)). In this respect, the farmers' risk perceived emerges as a factor that can discourage the adoption of innovative technologies. This study confirms the findings of previous studies that farmers who view precision technology as a risky investment tend to have a negative perception of its use ([Hannus and Sauer, 2021](#)). Consequently, the more risk incline farmers are, the greater their intention to adopt precision technology ([Kakkavou et al., 2024](#); [Dadzie et al., 2022](#)).

6. Conclusions

This study examined the intention of a sample of Sicilian winegrowers to adopt PATs, using an extension of the TAM2 model integrated with risk attitude variables. The results indicate that there are many variables influencing winegrowers' intention, but among these, perceived usefulness and ease of use are the two key factors that most strongly support the intention to adopt PATs, highlighting the important role of skills and formal agricultural education. As expected, perceived risk was identified as the most significant barrier to PATs adoption. The above research results show that, the widespread of precision farming technologies can be promoted by a heightened comprehension among wine growers of the potential these technologies offer and the possibility of achieving high levels of efficiency in the resources' utilisation. Consequently, it becomes imperative to demonstrate to potential users

the practical benefits of precision technologies, thereby mitigating their perceived risks and fostering greater adoption.

The results of this study are of significant relevance in the context of globalisation, given that precision agriculture technologies play an essential role in improving the productivity and sustainability of agricultural systems. In a global market characterised by intensifying competition, the adoption of innovative solutions by farmers has the potential to enhance the efficiency of production processes, crop yields and sustainability through the rational use of resources. This, in turn, enables farmers to compete on a global scale.

6.1. Theoretical implications

Theoretically, the study makes two contributions. Firstly, the TAM2 model is used to analyse the key factors that affect the adoption of precision technologies in viticulture. This model overcomes the limitations of the traditional TAM model, which places greater emphasis on technical and enabling factors than on personal and inhibiting factors (Venkatesh and Bala, 2008). The study's main findings show that the TAM 2 model offers a robust explanation of winegrowers' behavioural intentions. Specifically, as theorised by Venkatesh and Davis (2000) and confirmed by recent literature (Hüttel et al., 2022; von Veltheim and Heise, 2020; Warshaw, 1980), subjective norms directly influence the intention to adopt precision technologies. However, this influence weakens over time as winegrowers gain experience. This result supports the conclusions of Masi et al. (2022) and Canavari et al. (2022) that social influence diminishes as users become more familiar with technological innovations. Furthermore, the results of the study confirm the partial statistical significance of the influence of cognitive instrument processes on winegrowers' perceived usefulness. More specifically, the perceived usefulness of introducing precision technologies in viticulture is significantly influenced by output quality and results demonstrability. This result supports the validity of TAM 2 in explaining behavioural intentions, and is backed up by a lot of empirical evidence showing that farmers are more likely to use precision technologies when they recognise that they can improve process and decision efficiency (Boubker, 2024; Saari et al., 2022; Khoza et al., 2021; Far and Rezaei-Moghaddam, 2017). The study ultimately affirms that perceived usefulness and perceived ease of use are key predictors of the intention to adopt precision technologies. This corroborates the findings of previous studies, which suggest that decisions to adopt technology are driven by the simplicity of implementable systems and potential benefits (Nguyen et al., 2024; Michels et al., 2020). However, some of the relationships predicted by the TAM2 model were not confirmed. For instance, the results do not corroborate the theory proposed by Venkatesh and Davis (2000) that subjective norms and image influence behavioural intention via perceived usefulness. Therefore, it appears that peer opinion formed through the use of precision technologies does not convince users of their value and potential, but rather improves their social image, i.e. how others perceive those who use these technologies (Moura et al., 2020; Alwabel & Zeng, 2021). Furthermore, unlike previous studies, the perceived usefulness of precision technologies in viticulture is not influenced by individual perceptions of their applicability (job relevance). According to Michels et al. (2021) and Hrynevych et al. (2022), the greater the applicability potential of innovations in different business activities, the greater the perceived usefulness. The lack of a significant relationship between subjective norms, images and job relevance and perceived usefulness could be due to the respondents' socio-demographic characteristics and the geographical context in which they operate. The Sicilian agricultural sector is, after all, in the early stages of a digital transition, and this study focuses on a sample of small and medium-sized enterprises owned by relatively elderly farmers. These winemakers tend to evaluate the perceived usefulness of precision agriculture technologies (PATs) based on more tangible variables, such as product quality and demonstrability of results. This provides concrete feedback to farmers who are less experienced in this technological field.

They focus less on symbolic aspects, such as subjective norms, image and relevance for work. Since precision agriculture practices are not yet widespread, it is difficult to obtain feedback that would increase the perceived usefulness of this technology from colleagues or acquaintances who have mostly never used these technologies. Similarly, adopting such technologies may not enhance a company's image, given that knowledge of and exposure to them is still limited.

Secondly, this study offers new insights by examining factors beyond those traditionally addressed in the literature, which has predominantly focused on cognitive aspects like perceived usefulness and ease of use. Importantly, the results confirm that farmers' risk attitudes significantly affect their intention to adopt precision technologies, with higher perceived risk correlating with a lower intention to adopt. These findings align with previous research by Hannus and Sauer (2021) and Kakkavou et al. (2024). Therefore, this empirical study clearly shows that the integrated conceptual framework of TAM 2 and risk attitude is effective in explaining farmers' intentions to adopt technological innovations. A more comprehensive perspective on the dynamics of PATs adoption is provided by this multidimensional approach, which suggests that future research efforts could further explore the interplay between individual perceptions, experiences and socio-economic context. Furthermore, the study tested the conceptual model developed, for the first time, on the wine industry, one of the most studied sectors in the field of management research and of strategic importance for the economic and social development of entire regions.

6.2. Managerial and policy implications

The study presents a set of practical implications both for managers and policy makers in the wine sector, which are of crucial importance to guarantee a real impact at the farm level, on the economic, social and environmental point of view. Firstly, within the winery, the results of the study highlight the necessity for wine growers and farmers to acquire new skills and develop competences to use PATs effectively and to overcome obstacles related to risk perception. Indeed, the development of specific skills has been shown to increase risk tolerance, as well as foster a greater willingness to change work routines. To achieve these objectives, it is essential to implement structured training programmes designed to provide theoretical and practical knowledge on the functionality of PATs and their integration into production processes. Such programmes should include activities such as workshops, field demonstrations and practical sessions organised directly on farms, ensuring contextualised and immediately applicable learning. This approach, in addition to fostering a more conscious and widespread adoption of PATs, would help maximise the economic and environmental benefits of their use. Changing business practices by moving from traditional farming approaches to data-driven decision making helps improve operational efficiency and resource management by optimising production inputs, reducing waste and improving overall productivity, with a real impact on farm economics. Furthermore, PATs allow monitoring of vineyard conditions in real-time, supporting predictive analytics that improves risk management and resilience to climate variability. In terms of the environment, implementing PATs would lead to the more sustainable use of natural resources, reducing water consumption and optimising fertilisation while limiting the environmental footprint of wine production. Finally, at a social level, the increased use of precision agriculture could help bridge the digital divide in rural areas. Despite the several advantages of precision farming technologies, their adoption especially in the Southern Italy, i.e. Sicily, is very limited due to a low digital culture. Many small and medium-sized wineries still rely on traditional cultivation methods, with a limited adoption of advanced technologies. The literature highlights the essential role of the entrepreneur in small and medium-sized companies, in overcoming the structural and financial barriers that are typical of smaller companies. The results of this study are therefore valuable information at the government level. In this regards, the results of the study make it possible to

identify some lines of action that can be taken to foster innovation in business models in wine companies. The findings show that growers who perceive investment in precision technology as risky and considers the use of precision technologies complex have a negative perception of the technology. Therefore, the high up-front costs and the need for specific skills are major challenges that can and must be addressed by policy makers to facilitate the digital transition of the agricultural sector. One way to overcome the initial barrier related to technology costs for companies in the sector is to provide them with non-repayable or low-interest loans. In Italy, for instance, the Common Agricultural Policy Strategic Plan (2023–2027) allocates financial resources to encourage innovation and mechanisation in the agricultural sector, encompassing the utilisation of precision technologies. This support serves to confirm the commitment of the Common Agricultural Policy, and more specifically, of the rural development policy of the preceding programming period. The latter had envisaged support for agricultural enterprises for the procurement of machinery and equipment with superior technology (precision farming) with regard to productivity, energy savings and environmental impact. Nevertheless, in numerous instances, these financial incentives prove inadequate in ensuring the digital transition, particularly when the utilisation of technologies is more intricate than the competencies possessed by farmers. Consequently, it is imperative to cultivate a digital culture and skills among winemakers. Greater knowledge of technologies and the potential benefits they can bring in terms of business objectives could encourage their adoption. In this respect, the CAP Strategic Plan for 2023–2027 includes several measures to promote digitisation in agriculture and rural areas. Some of these measures fall under the SRH intervention on knowledge exchange and information dissemination. The SRH intervention on knowledge exchange and information dissemination includes financial support for the creation of advisory services to promote the use of digital tools (SRH-01), as well as training and updates for farmers in the field of digitisation (SRH-03). The study revealed that social norms influence technology adoption, so it is essential to promote networking and knowledge sharing. In light of this, peer-to-peer exchanges, supported by agricultural and rural development policies, could raise awareness among winegrowers of the importance of adopting technologies that not only improve business profitability but also reduce the environmental footprint of production. This combination of knowledge transfer, hands-on experimentation, and financial facilitation will hopefully accelerate the adoption process, ensuring that even the most traditional wineries will benefit from the digital transformation.

6.3. Limitations and future research directions

Nevertheless, the results of this study may not be generalisable due to its limitations. Firstly, the results are based on a sample that is not statistically representative of the population as a whole. Although informative, the sample size of 128 participants is relatively small for

hypothesis testing in technology adoption studies, which limits the findings' generalisability. Consequently, the results may not be applicable to a larger population of wine growers or the wider agricultural sector. Furthermore, focusing on Sicily, a region with specific socio-economic and digitalisation characteristics, limits the generalisability of the findings. The results may differ in regions with higher levels of digitalisation, or in sectors that are more accustomed to adopting innovative technologies. Several directions for future research can be identified based on these limitations. Similar studies are recommended in different wine-growing regions characterised by varying socio-economic characteristics and degrees of digitisation. This would verify the validity of the proposed conceptual model in explaining farmers' intentions to introduce precision technologies. A more comprehensive theoretical understanding of the intention to adopt precision farming technologies in relation to regional specificity would be provided by this. Furthermore, using a larger, more representative sample of wine-growing operations would improve the generalisability and robustness of the results, as well as strengthening the proposed conceptual model. Furthermore, the differences between small and large producers could be studied to identify tailor-made adoption strategies, with gender and generation also investigated in terms of their role in the adoption of PATs. These lines of research could have the potential to provide new insights into the dynamics of PATs adoption, thus supporting policies and strategies to facilitate innovation adoption in the agricultural sector. Finally, future studies could examine how generational factors, gender, educational level and winegrower experience influence the intention to adopt precision technologies in viticulture and agriculture more broadly.

CRedit authorship contribution statement

Adriano Biondo: Writing – review & editing, Writing – original draft, Investigation, Data curation, Conceptualization. **Giuseppina Rizzo:** Writing – review & editing, Writing – original draft, Visualization, Methodology, Formal analysis, Data curation. **Giuseppina Migliore:** Writing – review & editing, Writing – original draft. **Antonino Galati:** Writing – review & editing, Writing – original draft, Validation, Supervision, Methodology, Funding acquisition, Formal analysis, Conceptualization.

Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: ANTONINO GALATI reports financial support was provided by POC Sicilia 2020-2024. If there are other authors, they declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix

Table A
Utilized constructs.

Constructs	Items
Intention to Use	If I had access to precision agriculture technologies, I would be inclined to use them. Since I have access to precision agriculture technologies, I plan to use them.
Perceived Usefulness	If I used precision agriculture technologies, my work performance would improve. If I used precision agriculture technologies in my work, I could obtain a greater amount of grapes. If I used precision agriculture technologies, I could enhance the precision and effectiveness of agricultural operations. If I used precision agriculture technologies, I might realize that they are useful in my work.

(continued on next page)

Table A (continued)

Constructs	Items
Perceived Ease of Use	If I interacted with precision agriculture technologies, I would easily understand how to use them. If I had to interact with precision agriculture technologies, it would not require much mental effort. If I used precision agriculture technologies, I would find them easy to use.
Subjective Norm	If I had to use precision agriculture technologies, I would find it easy to get them to do what I want. People who influence my behavior think I should use precision agriculture technologies.
Voluntariness	Important people to me think I should use precision agriculture technologies. I would use precision agriculture technologies even if they are not mandatory.
Image	Even though it might be useful, using precision agriculture technologies is not necessarily mandatory in my work. Colleagues who use precision agriculture technologies have more prestige than those who do not. Colleagues who use precision agriculture technologies have a high profile.
Job Relevance	Adopting precision agriculture technologies is a status symbol in my work and among my colleagues. In my work, using precision agriculture technologies is important. In my work, using precision agriculture technologies is relevant.
Output Quality	Using precision agriculture technologies improves the efficiency of vineyard operations. I have no doubt that precision agriculture technologies improve the efficiency of vineyard operations.
Result Demonstrability	I have no difficulty explaining to others what the results of using precision agriculture technologies would be. I believe I can communicate to others the consequences of using precision agriculture technologies.
Experience	The results of using precision agriculture technologies are not obvious. I would have difficulty explaining whether their use can be advantageous or not. I think the requirements for using precision agriculture technologies are too complex for my agricultural activity.
Risk perception	I know companies that use precision agriculture technologies. I think using precision agriculture technologies is very risky. I think using precision agriculture technologies is safe. I think using precision agriculture technologies is questionable.
Risk tolerance	I think using precision agriculture technologies is associated with many risks. When making decisions for my business, I prefer certainty over uncertainty. I avoid risks when deciding for my activity. I like taking financial risks. I prefer to “play it safe” when making decisions regarding my business.

Table B

Structural model – Multicollinearity check (VIFs).

Variable	Perceived Ease of Use	Intention	Perceived Usefulness	Image
Subjective Norms	1.511	1.173		1.000
Perceived Usefulness		2.525		
Perceived Ease of Use		2.313		
Image	1.425			
Job Relevance	1.415			
Output Quality	3.864			
Result Demonstrability	3.531			
Risk perception	1.683		1.000	
Risk tolerance		1.212		

Table C

Measurement model – Standardized loadings.

	Reflective: Subjective Norms	Reflective: Perceived Usefulness	Reflective: Perceived Ease of Use	Reflective: Image	Reflective: Job Relevance	Reflective: Output quality	Reflective: Result Demonstrability	Reflective: Risk perception	Reflective: Risk tolerance	Reflective: Intention
Subjective Norms 1	0.963									
Subjective Norms 2	0.967									
Perceived Usefulness 1		0.909								
Perceived Usefulness 2		0.819								
Perceived Usefulness 3		0.913								
Perceived Usefulness 4		0.914								
Perceived Ease of Use 1			0.901							
Perceived Ease of Use 2			0.869							
Perceived Ease of Use 3			0.925							
Perceived Ease of Use 4			0.849							
Image 1				0.932						
Image 2				0.896						
Image 3				0.879						

(continued on next page)

Table C (continued)

	Reflective: Subjective Norms	Reflective: Perceived Usefulness	Reflective: Perceived Ease of Use	Reflective: Image	Reflective: Job Relevance	Reflective: Output quality	Reflective: Result Demonstrability	Reflective: Risk perception	Reflective: Risk tolerance	Reflective: Intention
Job Relevance 1					0.973					
Job Relevance 2					0.972					
Output Quality 1						0.988				
Output Quality 2						0.989				
Result Demonstrability 1							0.973			
Result Demonstrability 2							0.978			
Result Demonstrability 3							0.761			
Risk perception 1								0.862		
Risk perception 2								0.982		
Risk perception 3								0.754		
Risk perception 4								0.728		
Risk tolerance 1									0.898	
Risk tolerance 2									0.890	
Risk tolerance 3									0.871	
Risk tolerance 4									0.782	
Intention 1										0.916
Intention 2										0.895
Cronbach	0.912	0.781	0.909	0.886	0.943	0.976	0.732	0.362	0.656	0.781
DG	0.964	0.938	0.901	0.936	0.930	0.972	0.988	0.847	0.810	0.901
rho_A	0.929	0.920	0.929	0.787	0.920	0.890	0.943	0.976	0.960	0.836

Table D

Discriminant validity – Squared interfactor correlation vs. Average variance extracted (AVE).

	Subjective norms	Perceived usefulness	Risk perception	Perceived ease of use	Image	Job relevance	Output quality	Result demonstrability	Perceived usefulness	Risk tolerance	Intention to use
Subjective norms	1.000	0.058	0.087	0.130	0.158	0.129	0.105	0.074	0.003	0.043	0.087
Perceived usefulness	0.058	1.000	0.656	0.409	0.011	0.329	0.420	0.282	0.308	0.204	0.656
Risk perception	0.087	0.656	1.000	0.547	0.006	0.211	0.341	0.373	0.144	0.248	1.000
Perceived ease of use	0.130	0.409	0.547	1.000	0.022	0.092	0.182	0.203	0.083	0.080	0.547
Image	0.158	0.011	0.006	0.022	1.000	0.205	0.082	0.046	0.018	0.000	0.006
Job relevance	0.129	0.329	0.211	0.092	0.205	1.000	0.642	0.152	0.218	0.119	0.211
Output quality	0.105	0.420	0.341	0.182	0.082	0.642	1.000	0.218	0.377	0.244	0.341
Result demonstrability	0.074	0.282	0.373	0.203	0.046	0.152	0.218	1.000	0.390	0.202	0.373
Perceived usefulness	0.003	0.308	0.144	0.083	0.018	0.218	0.377	0.390	1.000	0.150	0.144
Risk tolerance	0.043	0.204	0.248	0.080	0.000	0.119	0.244	0.202	0.150	1.000	0.248
Intention to use	0.087	0.656	1.000	0.547	0.006	0.211	0.341	0.373	0.144	0.248	1.000
AVE	0.943	0.719	0.767	0.760	0.805	0.929	0.992	0.642	0.802	0.697	0.767

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