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Agricultural Tourism in Vietnam: Role of Technology for Perceived Sustainability and Visitors' Intention to Return

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Abstract

Agritourism combines visiting and experiencing farms, orchards, and other agricultural activities. It integrates traditional tourism with educational and recreational aspects of agriculture. Technological advancements have boosted tourism activities, changing the core values of sustainable tourism inherent in agriculture. This study analyzes tourists' behavior, perceptions of sustainable tourism, and the influence of technology on their intention to revisit the context of agritourism in Vietnam. Adopting a mixed-methods approach with structural instrument design, we used surveys to quantify visitors' attitudes, perceptions, and intentions. Implementing the partial least squares structural equation modelling (PLS-SEM) statistical method through Smart-PLS software version 4.0.9.2 ensures a robust analysis of the collected data. These findings provide original perspectives that can inform strategic and culturally sensitive initiatives, thereby enhancing sustainability and enriching experiences within Vietnam's agricultural tourism landscape. The nuanced insights derived from demographics, coupled with the acknowledgement of perceived behavioral control as a linchpin, add a unique dimension that directly influences visitors' intentions to return. Furthermore, recognizing technology's pivotal role, alongside concerns about sustainability and cultural impact, underscores the importance of a balanced integration approach.

Keywords: Agricultural tourism, technology, sustainability, revisit intention, emerging market

1. Introduction

Agricultural tourism, a burgeoning niche within the broader tourism industry (Abdullah et al., 2022), has gained considerable attention in recent years due to its potential to bridge the gap between urban and rural environments (Susila et al., 2023; Wu et al., 2023). In the context of Vietnam, a country with a rich agrarian heritage, the exploration of agricultural tourism is particularly intriguing (Quang et al., 2022). This research investigated the multifaceted interplay between agricultural tourism, technology, perceived sustainability, and visitors' intention to return, contributing to the growing body of literature on sustainable tourism development.

Vietnam, with its diverse landscapes and vibrant agricultural practices, offers a unique platform for the convergence of agriculture and tourism (Van Long et al., 2020). The nation's economy has historically relied on its agricultural sector, serving as a fundamental pillar that has substantively influenced the country's cultural identity. Characterized by vast agricultural landscapes and a primarily rural population, constituting 62.7%, the agricultural sector remains a cornerstone in shaping the essence of the nation (Greenfield, 2022). In recent years, there has been a noticeable shift in the tourism landscape, with an increasing number of travelers seeking authentic and immersive experiences in rural settings (Cole & Ingalls, 2020). This surge in interest has propelled agricultural tourism to the forefront, prompting researchers to investigate the factors that influence its success and sustainability (Loureiro et al., 2022).

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While agricultural tourism holds immense potential, the incorporation of technology into this niche has become a central point of discussion. Technology, ranging from mobile applications and virtual reality to smart farming techniques, has the capacity to enhance the overall tourism experience and contribute to the sustainability of agricultural practices (Kumari et al., 2022). However, there remains a significant gap in understanding the intricate dynamics between technology, sustainability perceptions, and visitors' intention to return within the context of agricultural tourism in Vietnam.

Despite the increasing popularity of agricultural tourism in Vietnam, limited scholarly attention has been devoted to exploring the role of technology in shaping visitors' perceptions of sustainability and their subsequent intention to return (L. L. Tsai, 2020). Tsai's study reveals that flow experience, positive emotions, and event satisfaction directly influence the intention to revisit, with event satisfaction having the most significant impact. Furthermore, positive emotions serve as a mediator between flow experience and both event satisfaction and the intention to revisit. Existing studies often focus on broader aspects of sustainable tourism or technology adoption in the hospitality sector, neglecting the specific nuances of the intersection between agriculture and tourism. Moreover, as technology evolves rapidly, there is a need to comprehend its evolving impact on agricultural tourism in a developing nation like Vietnam.

Furthermore, while the concept of sustainability is integral to tourism development, its application and perception within the agricultural tourism context in Vietnam remains under-explored. Understanding how visitors interpret sustainability in the agricultural tourism setting, especially concerning the use of technology, can provide valuable insights for policymakers, practitioners, and local communities seeking to capitalize on the potential of this unique tourism segment (Janjua et al., 2023).

In light of these considerations, this research aims to address these gaps by examining the intricate relationships among the role of technology, perceived sustainability, and visitors' intention to return within the context of agricultural tourism in Vietnam. By doing so, this study aspires to contribute to the theoretical and practical understanding of sustainable tourism development, thereby fostering a more balanced and resilient future for Vietnam's agricultural tourism sector (Trupp & Dolezal, 2020).

2. Literature review

The theory of planned behavior (Ajzen, 1985) provides a robust theoretical framework for understanding and predicting visitors' intention to return in the context of agricultural tourism in Vietnam. The model comprises key constructs such as attitude toward agricultural tourism, subjective norms, and perceived behavioral control, which collectively shape visitors' intentions to participate in agricultural tourism activities (Mohammadrezaei et al., 2023). Visitors' attitudes toward the experience, subjective norms influenced by societal and peer approval, and perceived behavioral control regarding obstacles or facilitators all play pivotal roles in determining their intention to engage in agricultural tourism. Building upon this established model, our research expands its horizons by introducing the moderating variable of the role of technology. Technology, encompassing digital tools, applications, and smart farming practices, is posited to moderate the relationship between perceived sustainability and visitors' intention to return (Marchesani, 2023). Technology integration is expected to amplify the impact of perceived sustainability on visitors' intention to return, emphasizing the transformative role technology plays in shaping the overall tourism experience and influencing sustainable practices (Kokash et al., 2024). Similarly, previous studies have highlighted that individuals who cultivate positive or negative attitudes towards engaging in such behaviors are likely to show matching intentions to revisit, suggesting a strong link between attitude formation and behavioral intentions (Bianchi et al., 2017). By bridging the gap between perceived sustainability and visitors' intention to return, the model provides an understanding of the intricate dynamics in the agricultural tourism sector in Vietnam, shedding light on the nuanced interplay between traditional agricultural experiences and contemporary technological advancements.

2.1 Attitude toward agricultural tourism

Attitude, as a central component of the theory of planned behavior, serves as a crucial determinant

of visitors' inclination to participate in agricultural tourism activities. Numerous studies highlight the significance of a positive attitude as a driving force behind tourist engagement in unique and culturally immersive experiences (Tussyadiah et al., 2018; Yin et al., 2023). In the context of agricultural tourism in Vietnam, a positive attitude is expected to be positively associated with visitors' perceived sustainability.

Perceived sustainability becomes a pivotal link in this relationship, acting as a mediating factor between attitude and intention to return (Dabbous & Tarhini, 2019). Tourists with favorable attitudes are likely to perceive agricultural tourism experiences as environmentally, socio-culturally, and economically sustainable, aligning with the broader global trend towards responsible and eco-friendly tourism practices (Li et al., 2023; Olya et al., 2023). Recent publications suggest that sustainable practices contribute positively to visitors' overall satisfaction and sense of fulfillment, thus enhancing their intention to return to the destination (Kamrul Hassan et al., 2023).

Moreover, the integration of technology into agricultural tourism experiences introduces a moderating influence on this relationship. Technology, in the form of digital applications, virtual reality, and smart farming practices, has the potential to amplify the positive effects of perceived sustainability on visitors' intention to return (Tussyadiah et al., 2018). Related research suggests that technology-driven enhancements can foster a deeper connection between tourists and sustainable practices, thereby reinforcing positive attitudes and strengthening the intention to revisit agricultural tourism destinations (Yamagishi et al., 2023).

H1: Visitors' positive attitudes toward sustainability within agricultural tourism positively influence their intention to return.

2.2 Subjective Norms

Subjective norms, defined by the theory of planned behavior, involve the perceived pressure from society to perform certain behaviors. While social media can amplify this pressure by showcasing individual behaviors, it is not the core element driving the phenomenon of agritourism. In the realm of agricultural tourism, the impact of subjective norms is critical, as tourists frequently look for validation and approval from their social networks for their involvement in these activities. However, the essence of agritourism's appeal extends beyond social media's influence and is rooted in the authentic experiences and connections with agricultural life (Ajzen, 1985; Liu et al., 2020).

This perspective is further supported by recent findings. A comprehensive report underscores that subjective norms wield a considerable influence on tourists' choices to adopt sustainable practices within agritourism settings. These social pressures, whether amplified through social media or traditional social interactions, significantly guide tourists' commitment to sustainability (Brune et al., 2021), highlighting the intricate relationship between societal influences and individual decisions in the context of agritourism.

In the case of agricultural tourism in Vietnam, where traditional values and communal ties are deeply ingrained, subjective norms are likely to play a crucial role in shaping visitors' perceptions of sustainability (Mehraj et al., 2023). Positive subjective norms can contribute to the favorable evaluation of sustainable agricultural practices, fostering an environment where tourists view these practices as socially acceptable and culturally aligned (Megeirhi et al., 2020).

Moreover, the incorporation of technology in the form of social media, online reviews, and virtual communities, can amplify the impact of subjective norms on perceived sustainability and, consequently, on visitors' intention to return (Gössling, 2017). Tourists, influenced by subjective norms prevalent in their social networks, may utilize technology platforms to validate and reinforce their sustainable tourism decisions (Lin & Rasoolimanesh, 2023).

H2: Visitors who perceive stronger subjective norms toward sustainability within agricultural tourism are more likely to express an intention to return.

2.3 Perceived Behavioral Control

The concept of perceived behavioral control is vital for predicting behavior. In this study, it is standardized from the theory of planned behavior and its role in linking perceived control, sustainability, and tourists' intentions to revisit agritourism destinations. Exploring the nexus between perceived behavioral control, perceived sustainability, and visitors' inten-

tion to return in agricultural tourism. As an integral component of the theory of planned behavior, perceived behavioral control represents individuals' perceptions of ease or difficulty in engaging in a particular behavior. In the realm of agricultural tourism, it becomes especially pertinent, as visitors assess their ability to actively participate in sustainable practices and integrate these experiences into their travel itinerary (Ajzen, 1985; Zhao et al., 2022).

In the context of Vietnam's agricultural tourism, where visitors may encounter unfamiliar farming practices or cultural experiences, advanced IT can empower tourists to actively participate in sustainable activities, fostering a sense of personal capability and control (Susila et al., 2023).

Furthermore, technologies are increasingly applied to the agricultural sector through mobile applications, virtual reality, and smart farming techniques, which can enhance visitors' perceived control over their agricultural tourism experiences (Loureiro et al., 2020; Kokash et al., 2024). Research suggests that technology-driven advancements, such as interactive farm tours or digital guides, can provide tourists with a sense of mastery and control over their engagement with sustainable practices, consequently influencing their intention to return (Kapsalis, 2022; Metta et al., 2022).

Understanding the dynamic interplay between perceived behavioral control, perceived sustainability, and intention to return in the agricultural tourism context not only sheds light on tourists' perceived capability to adopt sustainable behaviors but also emphasizes the pivotal role technology plays in shaping these perceptions. This synthesis contributes to a comprehensive framework for sustainable tourism development, providing valuable insights for policymakers, practitioners, and researchers in the agricultural tourism sector in Vietnam.

H3a: Higher levels of perceived behavioral control over sustainability practices within agricultural tourism are associated with increased awareness of sustainability.

H3b: Visitors with a stronger perceived behavioral control regarding sustainability within agricultural tourism are more likely to express an intention to return.

2.4 Perceived sustainability tourism

Sustainability traditionally includes environmental, social, economic, and institutional dimensions, aiming to enhance both material and non-material well-being, ensure equity across generations, maintain biodiversity and ecological integrity, and protect cultural heritage (UNESCO, 2012; United Nations, 2001). Sustainable tourism, which has evolved into various forms like ecotourism and community-based tourism, aims to uphold these principles. Perceived sustainability tourism specifically relates to how tourists view the sustainability efforts of tourism activities, assessing their impact on the environment, society, and economy, ensuring that current actions do not hinder future needs (Guizzardi et al., 2022; Lee & Jan, 2019). This perception plays a crucial role in shaping tourists' decisions and promoting more sustainable travel practices.

Examining the relationship between perceived sustainability and visitors' intention to return within the context of agricultural tourism in Vietnam sheds light on the mediating role of perception in shaping tourists' behavioral intentions (Gannon et al., 2021; Zhou et al., 2023). Perceived sustainability, as a key mediating factor, encapsulates visitors' beliefs and evaluations regarding the environmental, sociocultural, and economic sustainability of agricultural tourism practices in Vietnam.

Related research on sustainable tourism has a strong positive correlation between perceived sustainability and visitors' intention to return in various tourism contexts (Tabaeeian et al., 2023; Thipsingh et al., 2022). In the specific case of agricultural tourism in Vietnam, where traditional values and eco-friendly practices are intertwined with the tourism experience, perceived sustainability becomes a crucial factor influencing visitors' decisions to revisit (Satrya et al., 2023).

Positive perceptions of sustainability contribute to visitors' overall satisfaction with their agricultural tourism experience, creating a sense of fulfilment and connection to the destination (Kamrul Hassan et al., 2023). When tourists perceive that their activities align with sustainable principles, it fosters a positive image of the destination, which, in turn, enhances their intention to return for future visits (S. I. N. W. Abdullah et al., 2019).

Furthermore, the relationship between perceived sustainability and intention to return is nuanced by the incorporation of technology. Modern advancements, such as mobile applications, virtual reality experiences, and smart farming practices, can amplify visitors' perceptions of sustainability (Kumari et al., 2022; Loureiro et al., 2020; Kokash et al., 2024). Technology enhancements not only showcase sustainable practices but also engage tourists in meaningful ways, reinforcing positive perceptions of sustainability and subsequently influencing their intention to return.

H4: There is a positive association between perceived sustainability practices and intention to return to agricultural tourism.

2.5 The moderating variable role of technology

The exploration of the moderating variable, the role of technology's impact on the relationship between perceived sustainability and visitors' intention to return in the context of agricultural tourism in Vietnam, introduces a dimension that reflects the transformative impact of technology on the tourism experience. While research has shown a positive association between perceived sustainability and visitors' intention to return (Lin et al., 2017; Tabaeeian et al., 2023), the role of technology as a moderating influence in this relationship has gained recent interest as an emerging field.

Technology acts as a facilitator, augmenting the perceived sustainability of tourism experiences and influencing visitors' return intentions (Phang & Kong, 2023; Talwar et al., 2023). Digital advancements, such as mobile applications offering real-time information on sustainable practices or virtual reality experiences showcasing eco-friendly initiatives, provide tourists with enhanced perceptions of the sustainability efforts within agricultural tourism settings (Li et al., 2023; Olya et al., 2023). This has the potential to strengthen the link between perceived sustainability and the intention to return, as technology becomes a conduit for delivering immersive and educational content.

Moreover, the interactive nature of technology allows visitors to actively engage with sustainable practices, fostering a deeper connection and understanding (Susila et al., 2023). The role of technology, in this context, emerges as a catalyst that not only showcases sustainability efforts but also engages visitors in a meaningful way, thus heightening their intention to revisit agricultural tourism destinations (Deb et al., 2023).

Understanding the interplay between perceived sustainability and intention to return, with the moderating influence of the role of technology, provides valuable insights for the design and implementation of sustainable tourism strategies. This literature review underscores the need for agricultural tourism stakeholders in Vietnam to leverage technology strategically, emphasizing its potential to enhance visitors' sustainable perceptions and foster long-term engagement with the destination.

H5: The moderating effect of technology positively influences the relationship between visitors' awareness of sustainability within agricultural tourism and their intention to return.

2.6 Visitors' intention to return

Understanding visitors' intention to return is crucial in the context of agricultural tourism in Vietnam, particularly as it pertains to the evolving role of technology and perceptions of sustainability. Recent research underscores that tourists' intention to return is intricately linked to their overall satisfaction, positive experiences, and the perceived value of a destination (Zhao, Z., et al., 2023). In the case of agricultural tourism, the intention to revisit farms and rural settings is influenced by a combination of factors, ranging from cultural authenticity to the incorporation of sustainable practices, and other variables: customer service, logistics, easy access, accommodations, meals, etc. (Chen et al., 2023).

Studies suggest that visitors' positive experiences and satisfaction with agricultural tourism activities significantly contribute to their intention to return (Kamrul Hassan et al., 2023; (Zhao, Z. et al., 2023). Agricultural tourism in Vietnam, with its rich cultural heritage and diverse landscapes, provides a unique setting where visitors can immerse themselves in authentic farming experiences. The intention to return, therefore, becomes a reflection of the quality and authenticity of these experiences.

The role of technology emerges as a pivotal factor in shaping visitors' intention to return. Technology not

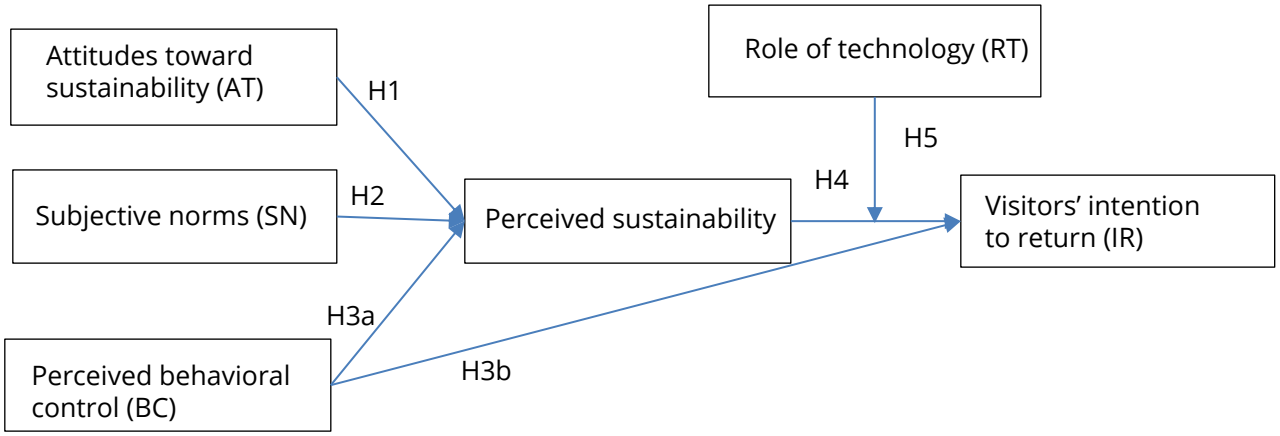

Figure 1. The conceptual framework and hypothesis.

only enhances the quality of the agricultural tourism experience but also acts as a catalyst for sustainable practices, positively influencing visitors' intention to return (Hossain et al., 2023).

Furthermore, the concept of perceived sustainability plays a significant role in shaping visitors' intention to return to agricultural tourism settings. Research indicates that tourists increasingly value destinations that demonstrate a commitment to environmental, socio-cultural, and economic sustainability (Olya et al., 2023; Li et al., 2023). The integration of sustainable practices in agricultural tourism becomes a key driver of visitors' positive perceptions, fostering a sense of responsibility and connection to the destination, thereby influencing their intention to return.

3 Methodology

3.1 Sample size

Ensuring an adequate sample size is crucial for the reliability of statistical methods like partial least squares structural equation modeling (PLS-SEM), guaranteeing robust results and the potential for generalization of the model. Inadequate sample sizes may lead to misleading outcomes. Following the recommendation (Hair Jr. et al., 2017), the 10 times rule is applied to determine the minimum sample size, 240 respondents. Specifically, this entails ensuring that the sample size is at least 10 times the number of items within the scale structure with the highest count and 10 times the number of action paths directed into the scale structure with the most paths (Hair et al., 2019). PLS-SEM employs this criterion based on either the largest formative observed variable or the greatest number of paths influencing a concept in the model (Becker et al., 2013). Hair and colleagues (2017) also suggest considering Cohen's (1992) standards for sample size calculations in many instances (Cohen, 1992).

The study was designed to collect 400 responses, with the actual collection yielding 368 responses, indicating a 92% recovery rate. Nonprobability sampling was employed, and data collection utilized a designed questionnaire. The questionnaire comprises two sections: one for general demographic information, including gender, group age, and job characteristics (Back et al., 2021; Bhat & Mishra, 2021) and the other focusing on the main content aligned with the research model of six constructs: Attitudes toward sustainability, subjective norms, perceived behavioral control, perceived sustainability, role of technology, visitors' intention to return.

3.2 Data collection

This study relies on primary data obtained directly from respondents through the distribution of questionnaires. To achieve the research objective, a two-phase survey process was employed (Li et al., 2008). In Phase 1, the comprehension of measurement concepts was tested on a group of 60 individuals. Moving to Phase 2 data collection, a formal sampling method was utilized. Vietnam has experienced a boom in agritourism, with local governments, organizations, and individuals capitalizing on agricultural features to create culturally immersive tourism offerings aligned with tourist interests (Jackie Ong, 2023). In Northern Vietnam, for instance, tours emphasize

rice cultivation and traditional crafts. Notable examples include the Cultural Rice Fields Experience and the Heritage Trail in Duong Lam Ancient Village, Hanoi. Additionally, the Hemp Collective group in Ta Phin, Sa Pa, and Lao Cai, offers unique experiences centered on rice cultivation and fishing in the fields (Hardwick et al., 2020). At agricultural tourist destinations, orchards, and hydroponic farms, domestic tourists were approached to seek permission to introduce the research context and explain measurement concepts. Those who agreed to participate were provided with a link to the survey contents.

This study utilizes a closed-end questionnaire methodology, incorporating a five-point Likert scale as a standardized psychometric instrument for assessing participant responses. The Likert scale, with values ranging from 1 (strongly disagree) to 5 (strongly agree), serves as the coding mechanism for capturing respondent feedback (Nicholas & Thapa, 2010). To instill participant confidence, a commitment to confidentiality was communicated, assuring individuals that their information would be handled with utmost privacy. Furthermore, researchers explicitly pledged to avoid any subsequent contact with participants under all circumstances, reinforcing the security and confidentiality of the collected data.

3.3 Data analysis

Cronbach's Alpa (α) was used to assess scale reliability A value of 0.6 or higher is considered satisfactory, indicating that scales are internally consistent and reliable for subsequent analysis (Nunnally, 1978).

For the examination of confirmatory factor analysis (CFA) and partial least squares structural equation modeling (PLS-SEM), the research utilized SmartPLS 4.0.9.2 software. PLS-SEM, as described by Hair and colleagues (2014). The software SmartPLS 4.0.9.2, chosen for its capabilities, facilitated the intricate analyses involved in assessing the relationships between various constructs in the research model.

4 Results

4.1 Descriptive analysis

Table 1 presents findings derived from 368 respondents, revealing that 42.1% were male and 57.9% were female. A majority of participants were between 30 and 39 years of age, constituting 54.9% of the total. Regarding job characteristics, 73.1% of those surveyed held employee positions, 12.8% were managers, and 14.1% belonged to the group with indefinite employment.

These demographic insights underscore a predominant female representation in the study sample, while the age distribution highlights a concentration of participants in the 30 to 39 age group. Furthermore, a significant proportion of respondents occupy employee positions, signifying a key aspect of the current job characteristics among those surveyed.

4.2 Reliability of measurement scales

In evaluating the internal consistency of measures, the widely accepted method involves computing the coefficient alpha for the constructs. As depicted in Table 2, all Cronbach's alpha values surpass 0.70, affirming the robust internal consistency of all measures (Nunnally, 1978). Furthermore, the outer loadings' values, exceeding the threshold of 0.708, indicate high reliability of the reflective constructs in scale measurement. To address potential multicollinearity issues within the inner model, Variance Inflation Factor (VIF) was scrutinized. The analysis revealed an absence of multicollinearity concerns, as all VIF values remained below 3, aligning with the defined threshold (Sarstedt et al., 2017). The metrics detailed in Table 2 underscore the study's methodological precision and enhance the credibility of the measurement concepts (Hair et al., 2020).

Table 1. Sample characteristics.

Demographics	Items	Frequency	Percentage
Gender			
	Male	155	42.1
	Female	213	57.9
Group age			
	18–29	93	25.3
	30–39	202	54.9
	40–49	21	5.7
	50–59	30	8.2
	Up 60	22	6.0
Job characteristics			
	Managers	47	12.8
	Employee	269	73.1
	Unemployed	52	14.1

Source: Authors' analysis from data, 2024.

Table 2. Result of analysis Cronbach's Alpha.

Items	Measurement scales	Cronbach's Alpha	Outer loading	Outer VIF
AT	Attitudes toward sustainability	0.905		
AT1	Engaging in agricultural tourism activities aligns with values and positive beliefs		0.888	2.821
AT2	Visitors believe that participating in agricultural tourism positively reflects their image and identity		0.880	2.810
AT3	Visitors have a favorable impression of agricultural tourism and perceive it as an enjoyable experience		0.897	2.820
AT4	Engaging in agricultural tourism gives me benefits		0.864	2.436
SN	Subjective Norms	0.897		
SN1	Visitors feel societal pressure to engage in sustainable practices during agricultural tourism activities		0.869	2.499
SN2	The opinions of my peers significantly influence my decision to participate in sustainable agricultural practices during my visit		0.870	2.554
SN3	Visitors perceive engaging in sustainable agricultural practices as socially acceptable within any social		0.881	2.926
SN4	Technology, such as social media and online reviews, plays a significant role in shaping my perception of sustainable norms during agricultural tourism		0.875	2.860
BC	Perceived behavioral control	0.896		
BC1	Visitors feel confident to actively engage in sustainable practices during agricultural tourism experiences		0.861	2.355
BC2	Visitors believes in the necessary skills to integrate sustainable activities into agricultural tourism itineraries.		0.895	2.828
BC3	Visitors perceive a high level of control over participation in sustainable practices during agricultural tourism		0.893	2.786
BC4	Technology, such as mobile applications and virtual reality experiences, enhances perceived control over sustainable activities during agricultural tourism		0.844	2.135
PS	Perceived sustainability	0.888		
PS1	Visitors believe that agricultural tourism practices in Vietnam are environmentally sustainable		0.846	2.491
PS2	Visitors perceive agricultural tourism activities in Vietnam as contributing positively to the socio-cultural sustainability of the region		0.885	2.952
PS3	Visitors evaluate the economic sustainability of agricultural tourism practices positively in Vietnam		0.873	2.490
PS4	Technology-enhanced aspects of agricultural tourism in Vietnam positively influence the perception of sustainability		0.857	2.329
RT	Role of technology	0.912		
RT1	Technology, such as mobile applications and online guides, improve understanding of sustainable practices during agricultural tourism		0.886	2.739
RT2	Visitors believe that tourism app support contributes positively to the enhancement of the sustainability of agricultural tourism		0.899	2.895
RT3	Smart farming practices, enabled by technology, positively influence visitors' perception of the environmental sustainability of agricultural tourism		0.890	2.757
RT4	The integration of ecosystem technology enhances satisfaction with the sustainability initiatives in agricultural tourism, influencing tourists' intention to return		0.885	2.822
IR	Visitors' intention to return	0.864		
IR1	Visitors' positive experience with sustainable agricultural practices enhances travelers' intention to return		0.832	1.912
IR2	The overall perceived sustainability of agricultural tourism activities positively influences tourists' desire to return		0.838	2.063
IR3	The integration of technology, such as app mobile, virtual reality, and smart farming, enhances visitors' intention to return for future agricultural tourism experiences		0.846	2.066
IR4	Visitors satisfaction with the technological role aspects and perceived sustainability of agricultural tourism significantly influences the intention to return in here		0.855	2.217

Source: Authors' data analysis, 2024.

Table 3. Convergent validity - Fornell and Larcker (1981).

	CR	AVE	AT	BC	IR	PS	RT	SN
AT	0.908	0.779	0.882					
BC	0.899	0.763	0.288	0.873				
IR	0.864	0.710	0.468	0.391	0.843			
PS	0.892	0.749	0.453	0.532	0.568	0.865		
RT	0.915	0.792	0.409	0.433	0.43	0.522	0.89	
SN	0.897	0.764	0.544	0.278	0.541	0.417	0.401	0.874

Source: Authors' data analysis, 2024.
Note: Attitudes toward sustainability (AT), perceived behavioral control (BC), visitors' intention to return (IR), perceived sustainability tourism (PS), role of technology (RT), subjective norms (SN), composite reliability (CR), average variance extracted (AVE).

4.3 Confirmatory factor analysis (CFA)

In Table 3, the analysis of convergent validity, following Fornell and Larcker's (1981) approach, reveals robust results. The use of composite reliability, favored over Cronbach's alpha in PLS-SEM (Hair Jr. et al., 2017) surpasses the recommended threshold of 0.70 (Bagozzi & Yi, 1988). Moreover, all standardized loadings for indicators exceed the benchmarks set by (Fornell & Larcker, 1981).

Moving on to construct validity, both convergent and discriminant aspects were thoroughly examined. Convergent validity, gauged by the average variance extracted (AVE), demonstrates its mettle with values exceeding 0.50, as illustrated in Table 3 and in alignment with Fornell and Larcker (1981).

Shifting focus to discriminant validity, the evaluation, as per Fornell and Larcker's (1981) guidelines, investigates whether latent variables exhibit stronger correlations with their own items than with those of other constructs. In Table 3, the square root of each construct's AVE (SQRT of AVEs) consistently outperforms the squared values of correlations between latent variables, a decisive indication supporting discriminant validity (Kock, 2015).

Bringing it all together, the outer model testing affirms the validity and reliability of the studied constructs. The convergence and divergence analyses, detailed in Table 3, collectively provide a strong foundation for the confidence in the measurement scale's ability to accurately reflect the underlying constructs.

4.4 Hypothesis testing

From Table 4, the results of the analysis of direct and indirect relationships indicate that the provided hypotheses are statistically significant. Analysis of the dynamic relationship of tourists' perception of sustainability tourism, based on the theory of planned behavior framework, reveals that the measured concepts, including attitudes toward sustainability, subjective norms, and perceived behavioral control, positively impact agricultural tourism activities. Notably, in the context of agricultural tourism activities in Vietnam, the concept of perceived behavioral control, for tourists, is indicated to be the highest, with a corresponding beta coefficient of 0.415. Additionally, individual perceived behavioral control directly influences visitors' intention to return, albeit with the lowest beta coefficient of 0.102.

On the other hand, the direct impact relationship between sustainable tourism activities and visitors' intention to return is also noted to have a positive correlation. Furthermore, this relationship is influenced by the role of technology as a moderating variable. The analysis results demonstrate that the moderating variable role of technology regulates the corresponding negative beta coefficient of -0.193. This reflects tourists' perception of concerns related to the use of technology in agricultural activities affecting environmental sustainability, foreign cultural impact, and the economic development of agricultural tourism (Kumari et al., 2022; Loureiro et al., 2020). Moreover, these findings may indicate that excessive application of technology in agricultural tourism activities may lead to conflicts between traditional culture and modern technology.

In addressing the issues related to the chain of effects leading to tourists' intention to return, approaching the analysis of reconciling effects is crucial (Kenny et al., 2018). The results highlight the intermediary role of sustainability tourism activities in the context of agricultural tourism, examining the

Table 4. Path coefficients of the concept framework.

Hypothesis	Relationships	Path coefficients	Standard deviation	T statistics	P-value
H1	AT → PS	0.240	0.051	4.686	0.000
H2	SN → PS	0.171	0.054	3.194	0.001
H3a	BC → PS	0.415	0.052	7.943	0.000
H3b	BC → IR	0.102	0.047	2.146	0.032
H4	PS → IR	0.290	0.067	4.353	0.000
H5	RT × PS → IR	-0.193	0.034	5.608	0.000

Source: Authors' data analysis, 2024.
Note: Attitudes toward sustainability (AT), perceived behavioral control (BC), visitors' intention to return (IR), perceived sustainability tourism (PS), role of technology (RT), subjective norms (SN).

Table 5. Total of direct and indirect effects.

Specific effects	Path coefficients	Standard deviation	T statistics	P values
BC → PS → IR	0.120	0.030	3.959	0.000
SN → PS → IR	0.050	0.019	2.567	0.010
AT → PS → IR	0.070	0.024	2.861	0.004
RT × PS → IR	-0.193	0.034	5.608	0.000

Source: Author's data analysis, 2024.

direct impact of tourism motivations and emphasizing the significant moderating role of technology at the destination concerning the intention to return.

The study revealed meaningful connections within the examined framework. Specifically, it explored the impact of tourists' perceptions of sustainability on their intention to return. The findings demonstrate significant effects in this area. Table 5 contains a detailed presentation of these results.

The research findings were synthesized, and the results of the analysis framework on tourists' intention to return, along with the moderating role of technology variables influencing tourists' intentions, were visualized.

5 Discussion

Agricultural tourism is a form of tourism that involves visiting and experiencing farms, fruit orchards, or other agricultural business activities. It is a blend of traditional tourism with the educational and entertainment aspects of agriculture. Over time, activities in this sector have evolved with technological advancements, and the applications of technology in tourism have altered the core values of sustainable tourism inherent in agriculture (Izquierdo-Gascón & Rubio-Gil, 2023). This study analyzes the dynamics of tourist behavior, considering the perceptions of sustainable tourism and the influencing factors of technology in regulating tourists' intentions to return within the context of agricultural tourism in Vietnam. The research results need to be interpreted and discussed in relation to studies in different contexts within the experiential tourism industry. Studies in agricultural tourism share a consensus, and the findings of this research align with a study by Dedeoğlu and colleagues (2022) in Turkey. The results, encompassing attitudes, subjective norms, and perceived behavioral control, reveal a positive and significant influence on the intention to consume local food. Furthermore, responsible tourist behavior acts as a moderator, influencing both of the relationships related to consumption intention (Balıkçıoğlu Dedeoğlu et al., 2022). This research examines demographic characteristics, tourists' views on sustainable tourism and their fit with the theory of planned behavior, the connection between these activities and visitors' intentions to return, and how technology influences this desire's impact. Each of these is thoroughly discussed, providing a more objective and comprehensive understanding of the findings.

The demographic profile allows insightful comparisons, emphasizing the study's significance. Gender distribution (42.1% male, 57.9% female) indicates

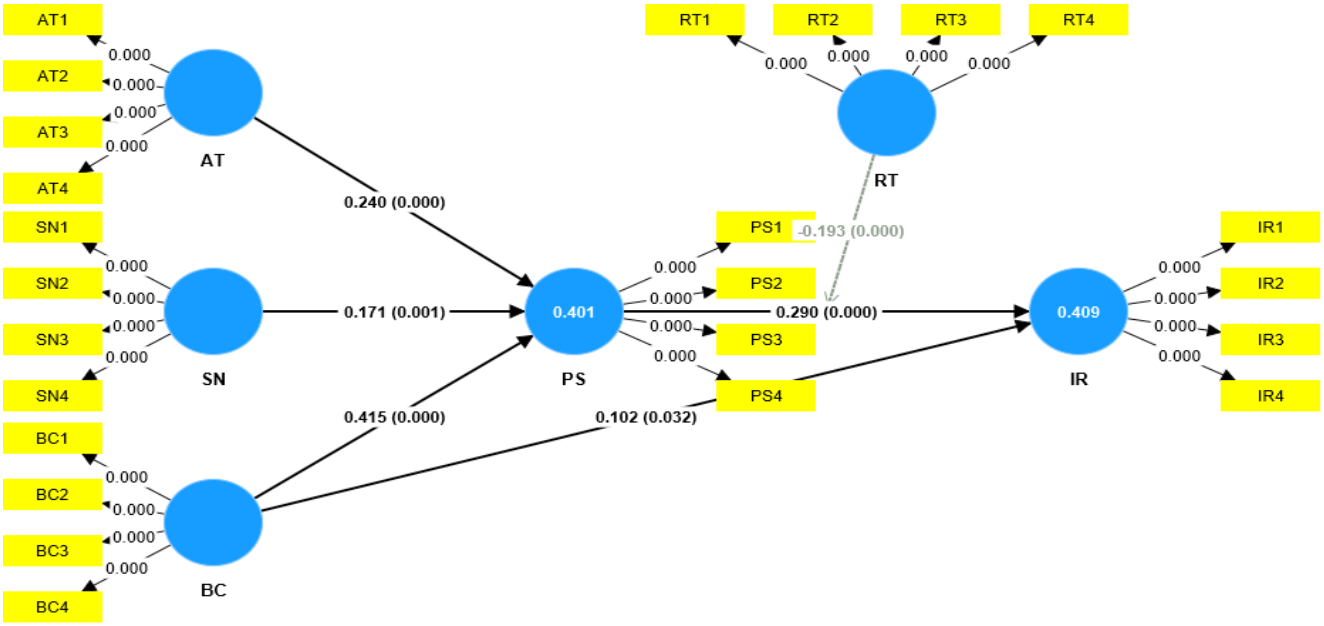

Figure 2. The path analysis of visitors' intention to return. Source: authors' data analysis, 2024.
Note: Attitudes toward sustainability (AT); perceived behavioral control (BC); VISITORS' intention to return (IR); perceived sustainability tourism (PS); role of technology (RT); subjective norms (SN).

balanced representation (Truong et al., 2014; Hai et al., 2020). Notably, 54.9% in the 30 to 39 age bracket suggests specific demographic interest. Job characteristics reveal 73.1% in employee positions, with 14.1% having indefinite employment, adding complexity. These demographics impact the study's variables; analyzing age and job roles may unveil nuanced insights into participant perspectives (Kronenberg & Fuchs, 2022). This comparative approach enhances the study's depth and applicability, emphasizing the importance of demographic considerations in understanding research outcomes.

The examination of tourists' perception of sustainability tourism, based on the theory of planned behavior, reveals a positive impact on agricultural tourism activities. In the specific context of Vietnam's agricultural tourism, the concept of tourists' perceived behavioral control stands out, with the highest beta coefficient of 0.415. This underscores its significant influence on tourists' engagement in agricultural activities. Notably, the influence extends to the visitors' intention to return, although the beta coefficient is the lowest, at 0.102. This intriguing finding prompts a deeper exploration of the complex relationship between perceived behavioral control and return intentions, enhancing our comprehension of the factors shaping tourists' behavior in agricultural tourism (He et al., 2023).

The direct impact relationship between sustainable tourism activities and visitors' intention to return exhibits a positive correlation. This relationship is influenced by the moderating variable role of technology (Deb et al., 2023). The analysis reveals that technology's moderating role regulates a corresponding negative beta coefficient of -0.193. This signifies tourists' concerns regarding the technological influence on environmental sustainability, foreign cultural impact, and the economic development of agricultural tourism (Raihan & Tuspekova, 2022). These findings suggest that an overreliance on technology in agricultural tourism may result in conflicts between traditional culture and modern technological practices, emphasizing the pivotal role of technology moderation in achieving a balanced and sustainable tourism experience (Susila et al., 2023).

The mention of technology's moderating role in reducing the strength of the positive relationship (as indicated by a negative beta coefficient of -0.193) suggests that as the influence of technology increases, it might negatively impact visitors' intentions to return. This negative impact could be due to tourists' concerns about how technology affects

environmental sustainability, impacts foreign cultures, and contributes to the economic development of agricultural tourism (Yersüren & Özel, 2024). This suggests that the way technology is integrated into sustainable tourism activities can influence tourists' perceptions and intentions (Ponnapureddy et al., 2019). If tourists perceive that technology is used in ways that harm the environment, overshadow local cultures, or disrupt the economic balance of local agricultural sectors, their intention to return may decrease (Tsai et al., 2016). For tourists wanting to return, this emphasizes the importance of carefully considering how technology is applied in tourism settings. Sustainable tourism should aim to integrate technology in a manner that enhances the visitor experience without compromising environmental integrity, cultural authenticity, and economic benefits for local communities (Bhatti & Alnasser, 2023).

6 Conclusion

In examining the multifaceted landscape of agricultural tourism in Vietnam, our research unfolds with a meticulous exploration of participant demographics. A balanced representation emerges, revealing a distinct demographic interest, particularly within the working age group. Job characteristics, dominated by employee positions, add complexity, hinting at the nuanced fabric of the agricultural tourism participant profile.

Transitioning into the realm of perception and behavior, our analysis, grounded in the theory of planned behavior framework, unravels the positive impact of tourists' attitudes toward sustainability, subjective norms, and perceived behavioral control on agricultural tourism activities. Notably, perceived behavioral control emerges as a linchpin, directly shaping visitors' intention to return. This underscores the profound influence of tourists' perceived control in sculpting their engagement and future interactions with the agricultural tourism landscape.

As our exploration delves deeper, the correlation between sustainable tourism activities and visitors' intention to return unveils a dynamic interplay, moderated significantly by technology. Technology's role, a key variable in this relationship, surfaces with paramount importance. Here, tourists express concerns about its implications on environmental sustainability, foreign cultural influence, and the economic trajectory of agricultural tourism (Gunn, 2014; Arabadzhyan et al., 2021). A cautionary note is sounded, emphasizing the potential conflicts arising from an overreliance on technology, including virtual reality headsets and interactive or virtual system displays, urging a balanced and culturally sensitive integration within the agricultural tourism context (Beck et al., 2019).

In conclusion, our research paints a comprehensive picture of agricultural tourism in Vietnam. From the intricate tapestry of participant demographics to the influential role of perceived behavioral control and the moderating impact of technology on sustainability, the findings weave together a narrative that calls for nuanced strategies. Balancing tradition and technology become imperative, underscoring the need for an approach that respects cultural roots while embracing advancements. As Vietnam's agricultural tourism landscape evolves, these insights provide a compass for sustainable growth and an enriching experience for both participants and visitors alike.

7 Implications (Practical, Social, Research)

The research underscores the potential for targeted strategies in agricultural tourism, particularly within the working age group. Tailoring experiences to the preferences and expectations of working professionals, given their dominance in employee positions, is crucial. Practical implications point towards customized offerings aligned with time constraints, enhancing engagement. Recognizing demographic diversity is essential for inclusive initiatives that ensure that benefits reach various societal segments (Baghirov et al., 2023). Socially, community engagement and cultural sensitivity contribute to the sustainability of agricultural tourism in Vietnam. These insights lay the foundation for future research, exploring the evolving interplay between employment dynamics, lifestyle choices, and agricultural tourism preferences.

Within the framework of the theory of planned behavior, our analysis reveals implications for agricultural tourism in Vietnam. Tourists' positive attitudes towards sustainability, subjective norms, and perceived behavioral control shape their engagement.

The emergence of perceived behavioral control as a linchpin, influencing visitors' intention to return, highlights a critical touchpoint for practical interventions. Businesses can design empowering experiences, fostering control and connection (Annamalah et al., 2023). Socially, understanding tourists' perceived control encourages community involvement, contributing to social sustainability. Future research can delve into evolving dynamics between technology, sustainability, and visitors' intentions, providing insights for continued development.

In exploring the correlation between sustainable tourism activities and visitors' intention to return, technology's influential role emerges. Practical implications emphasize the need to address tourists' concerns about technology's impact on sustainability, cultural influence, and the economic trajectory of agricultural tourism (Zhao, X., et al., 2023). A delicate balance between technological integration and cultural sensitivity is imperative. Socially, community engagement and education initiatives are needed to promote responsible and culturally mindful technology use (Parvatiyar & Sheth, 2023). The cautionary note in our findings opens avenues for future research, exploring intricate dynamics between technology, sustainability, and visitors' intentions, guiding sustainable advancements in Vietnam's agricultural tourism.

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9 Appendix. Research Ethics Approval Form

Research Ethics Approval Form: Everyone conducting research activity that involves human participants or the use of data collected from human participants is required to gain ethical approval before commencing research. Please answer all relevant questions and note that your form may be returned if incomplete. For further support and guidance please contact the author's workplace. Please complete this form in good time before your research project is due to commence.

Section 1: Basic filtering

Title: Agricultural tourism in Vietnam: Role of technology for perceived sustainability and visitors' intention to return

1. Researcher

The first author: Ngoc Bao Nguyen, Faculty of Marketing, Thuongmai University, Hanoi city Vietnam, Corresponding email*: ngocnb@tmu.edu.vn; https://orcid.org/0009-0000-1487-3847
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2. Intended research start date and end date: from March 10 to September 30, 2023.

Section 2: Research Summary

Please select all research methods that you plan to use as part of your research:

- Interviews: Yes
- Questionnaires: Yes
- Observations: No
- Use of Personal Records: No
- Data Analysis: Yes
- Action Research: No
- Focus Groups: No
- Other (please specify): .....

Section 3: Participants

Please answer the following questions, giving full details where necessary. Will your research involve human participants? Who are the participants?

Under 18 years old – stop

Over 18 years old – Continue

To inform survey participants about our research, we will share the questionnaire through a link on drive.google.com, detailing the study's purpose to offer them the choice to participate. Before distributing the link, we will seek consent from tourists who have expressed interest in participating. The link will then be sent via Vietnam's messaging application, Zalo, to those who have agreed. For those who do not consent, the link will not be sent.

How will you obtain consent from participants?

At each destination, we approached tourists to introduce ourselves and briefly explain our research's purpose, asking for a few minutes of their time. Upon receiving their agreement, we provided a more detailed explanation of the research concepts. For those tourists who consented to participate, we then shared the survey link through the Zalo messaging app.

How will it be made clear to participants that they may withdraw consent to participate at anytime?

Participants have the option to refrain from responding, revisit their answers, or opt not to answer once the data collection period ends, at which point the link will automatically deactivate. This action will be considered as the participant retracting their consent.

Studies involving questionnaires: Will participants be given the option of omitting questions they do not wish to answer?

Yes ☐ No ☑

If No please explain why below and ensure that you cover any ethical issues arising from this.

Answer: There are no ethical concerns with this approach since participants are given the choice to select the "Cancel" option, allowing them to skip questions as they wish. Sections left unanswered will be deemed incomplete, and the corresponding data will be excluded from the analysis.

Studies involving observation: Confirm whether participants will be asked for their informed consent to be observed.

Yes ☐ No ☑

Will you debrief participants at the end of their participation (i.e. give them a brief explanation of the study)?

Yes ☑ No ☐

Will participants be given information about the findings of your study?(This could be a brief summary of your findings in general)

Yes ☑ No ☐

Section 4: Data Storage and Security

Confirm that all personal data will be stored and processed in compliance with the Data Protection Act (1998)

Yes ☑ No ☐

Who will have access to the data and personal information?

During the research: Author

Where will the data be stored? https://forms.gle/DRYYyNFTRqbhg4HN8

Will mobile devices such as USB storage and laptops be used?

Yes ☑ No ☐

If yes, please provide further details: Project laptop

After the research:

Where will the data be stored?

Answer: The data will be stored in a password-protected file on storage to maintain its confidentiality.

How long will the data and records be kept for and in what format?

Answer: The data will be kept in the pdf format for 2 years and after two years it will be disposed of so that no one can damage the confidentiality of the data.

Will data be kept for use by other researchers?

Yes ☐ No ☑

If yes, please provide further details:

Section 5: Ethical Issues

Are there any particular features of your proposed work which may raise ethical concerns? If so, please outline how you will deal with these: It is important that you demonstrate your awareness of potential risks that may arise as a result of your research. Please consider/address all issues that may apply. Ethical concerns may include, but are not limited to the following:

- Informed consent.
- Potentially vulnerable participants.
- Sensitive topics.
- Risks to participants and/or researchers.
- Confidentiality/anonymity.
- Disclosures/limits to confidentiality.
- Data storage and security, both during and after the research (including transfer, sharing, encryption, protection).
- Reporting.
- Dissemination and use of your findings.

Answer: The research's ethical guidelines encompass obtaining informed consent from participants, which will be secured by sharing detailed information about the study and considering their acknowledgement as an agreement to participate. To ensure data confidentiality, all collected information will be kept in a password-protected file, which will be securely disposed of after two years. Only individuals directly involved in conducting the research will have access to this file. The research findings will be exclusively utilized for exploring the research questions, and no personal data will be used in the study.