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RESEARCH ARTICLE
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Assessing Farmers' Intentions to Adopt Good Coffee Farming Practices: The Perspective of the Theory of Planned Behavior and Behavioral Reasoning Theory

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ABSTRACT

Coffee is a globally traded commodity produced mainly by smallholder farmers, whose production fluctuates due to the cultivation systems implemented. Adopting Good Agricultural Practices (GAPs) is crucial for supporting the sustainability of coffee farming and contributing to the achievement of the Sustainable Development Goals. However, GAP adoption at the farmer level remains low, necessitating a more in-depth analysis of the psychological and structural factors that influence it. This study aims to analyze the factors affecting coffee farmers' intentions and behavior in adopting GAP by integrating Behavioral Reasoning Theory (BRT) and the Theory of Planned Behavior (TPB) frameworks. Using a quantitative survey of 380 smallholder coffee farmers in Central Java, analyzed with structural equation modeling, the findings reveal that farmers' beliefs both for and against sustainable farming strongly influence their attitudes, subjective norms, and perceived behavioral control. These constructs significantly drive intentions to adopt GAP, but intention alone is insufficient to ensure adoption due to both internal and external barriers. Enhanced GAP adoption requires addressing these barriers, particularly by strengthening farmers' reasoning and intentions, and supporting them through capacity building, institutional reinforcement, expanded agricultural extension, and enabling government policies. This study advances theoretical understanding of agricultural innovation adoption by integrating the BRT–TPB framework and offers actionable insights for designing interventions to foster sustainable smallholder coffee farming systems.

Keywords: Coffee smallholders; Farmer attitudes; Good agricultural practices; Sustainability.

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INTRODUCTION

Coffee is not only the most widely traded agricultural commodity in the world, but also plays a significant role as a global food source and a source of livelihood for smallholder farmers (Tamru & Minten, 2023; Chéron-Bessou et al., 2024). According to the United States Department of Agriculture data, global coffee supply comes from exporters from producing countries, including Indonesia, which ranks fourth among the world's coffee producers. Global coffee production reached 169.35 million bags (60kg) in 2023 and increased to 174.40 million bags in 2024. It is further projected to rise by 4.3 million bags in 2025. However, according to data from the Central Statistics Agency (BPS), Indonesia's coffee production showed a different trend. National production was 774.96 thousand tons in 2022, declined by 2.10% to 758.73 thousand tons in 2023, and then increased to 807.58 thousand tons in 2024. Indonesian coffee production fluctuates, a challenge, particularly from an economic perspective, as it impacts farmer welfare, local economic stability, and the sustainability of the agricultural system. This condition also poses a challenge in realizing the Sustainable Development Goals (SDGs), particularly poverty eradication, zero hunger, and responsible consumption and production, emphasizing the importance of sustainable agricultural practices to support food security while maintaining socio-economic balance.

The sustainability of coffee cultivation systems is increasingly affected by climate change phenomena such as prolonged droughts, temperature fluctuations, and shifts in rainfall patterns, all of which pose serious risks to productivity (Grüter et al., 2022). Climate change alters the

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climatic suitability required for optimal coffee growth, resulting in reductions in coffee-suitable areas in several major coffee-producing regions in Indonesia, including Aceh, North Sumatra, South Sumatra, and Lampung. This decline in suitable land has had a significant impact on national coffee production (Sarvina et al., 2023). In addition to climatic stress, internal factors—particularly the limited adoption of Good Agricultural Practices (GAP) due to farmers' attitudes and entrenched cultural practices—further contribute to low productivity and suboptimal coffee quality, ultimately reducing farm income (Pham et al., 2022; Wright et al., 2024; Sia et al., 2025). Farmers' intentions in cultivating coffee are not only due to technical and economic considerations, but are influenced by socio-psychological factors (Swart et al., 2023). The varying levels of GAP adoption at the farmer level present a barrier to achieving national coffee production targets.

Efforts to increase GAP adoption at the farmer level have been supported by government interventions through extension services, training, and certification schemes. However, these initiatives have not been fully effective, as a considerable proportion of farmers still do not implement GAP in their cultivation practices (Jones et al., 2024; Wright et al., 2024). This suggests that farmers' behavior toward adoption is determined by their intentions, which are influenced by attitudes toward the innovation, prevailing social norms, perceived behavioral control and reasons for or against adoption. Integrating socio-psychological factors and technical considerations is a comprehensive approach to analyse GAP adoption behavior at the farmer level, in line with the behavioral theory frameworks (Savari et al., 2023). Behavioral Reasoning Theory (BRT) provides a conceptual bridge to the Theory of Planned Behavior (TPB) by explaining how individuals' underlying reasons shape their evaluative and cognitive processes, which ultimately guide their intentions and subsequent behaviors (Ajzen, 2020; Xu et al., 2024). Integrating TPB and BRT enhances intervention strategies by combining cognitive, emotional, and contextual dimensions. Recent studies have applied this integration to analyze farmers' intentions to adopt drought insurance (Cabeza-Ramírez et al., 2024), yet its use in coffee farming remains limited, as research in this field has largely emphasized production techniques and the TPB framework alone.

This study aims to analyse the socio-psychological factors influencing coffee farmers' intention to adopt GAP by integrating BRT and TPB. The novelty of this study lies in integrating two behavioral theories in the context of coffee farming in Indonesia, thus providing a comprehensive understanding of the factors that hinder and encourage GAP adoption. This study has practical implications in supporting the achievement of the SDGs by providing evidence-based policy recommendations to encourage the transformation of coffee cultivation practices towards long-term sustainability.

MATERIALS & METHODS

Basic Methods of Research

This study applied a quantitative survey design to examine socio-psychological factors influencing coffee farmers' adoption of GAP. The survey approach was selected for its capacity to capture representative behavioral data and provide an empirical foundation for multivariate analysis (Nattino et al., 2025). Temanggung Regency, Central Java (Fig. 1), was purposively chosen as the study site given its agroecological suitability and prominence as the province's leading coffee production area. The sample locations were determined using a cluster sampling technique based on sub-districts with high potential for robusta and arabica coffee production. Three sub-districts Tertep, Wonoboyo, and Candiroto, were selected because they represent areas with significant potential for both coffee varieties (Ahmed, 2024).

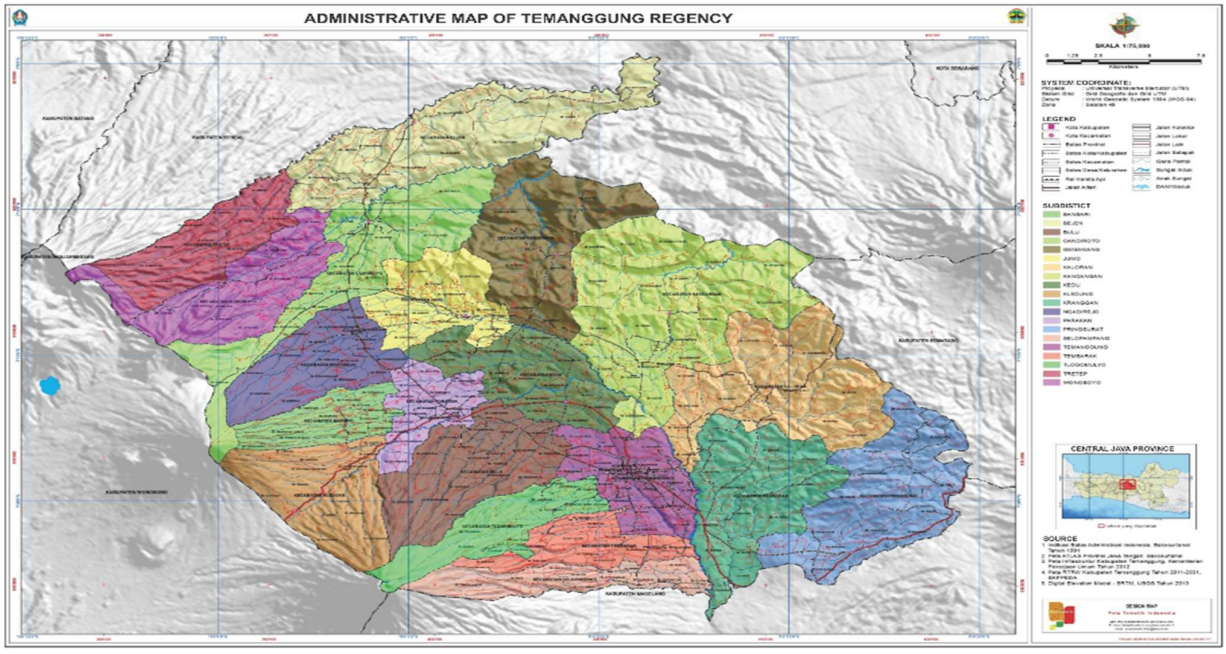

Fig. 1: Research Location (Source: https://petatematikindo.wordpress.com).

A sample of 380 smallholder farmers was obtained through simple random sampling, exceeding the recommended threshold for behavioral studies and ensuring analytical rigor (Chomeya et al., 2024). Data were collected through interviews using a structured questionnaire that had been previously tested for validity and reliability (Ranganathan et al., 2024). The instrument's validity and reliability were assessed using responses from 30 coffee farmers. The validity test produced significant item–total correlation values, while the reliability test showed a Cronbach's alpha coefficient exceeding the recommended threshold of ≥ 0.70 (Schober et al., 2018), indicating satisfactory internal consistency.

Data Analysis

The collected data were analysed using Structural Equation Modelling based on Partial Least Squares (SEM-PLS), as it is capable of handling complex models with latent variables and data that is not fully normally distributed (Hair et al., 2021). The study was done in two main parts. First part, checked the measurement model to see if the indicators were reliable and valid. Reliability was checked using Cronbach's Alpha and Composite Reliability, and values above 0.7 were considered good (Ahmed, 2024). Convergent validity was checked by looking at outer loadings (more than 0.7) and average variance extracted (more than 0.5). Discriminant validity was tested using the Fornell-Larcker criterion and the HTMT ratio (Hair et al., 2021; Ringle et al., 2023). Second, observing the structural model used bootstrapping to demonstrate the relationship between variables, using path coefficients, t-statistics, and p-values (Dybro Liengaard, 2024). Furthermore, the coefficient of determination (R^2) was used to determine the variation in data explained by the model, and the predictive relevance (Q^2) showed how well the model can predict the outcomes (Hair et al., 2021).

Hypothesis

In order to increase the adoption of good agricultural practices (GAP), this study develops a conceptual framework of behavioral theory. Behavioral Reasoning Theory (BRT) positions cognitive reasons (for and against) and value beliefs as the basis for forming attitudes, norms, and perceived behavioral control in the Theory of Planned Behavior (TPB) (Xu et al., 2024). Meanwhile, TPB explains that these three constructs shape intentions and actual behavior (Sok et al., 2021).

Belief in sustainable farming (BSF) is a basic value influencing farmers' cognitive reasoning. Farmers' belief in the economic, environmental, and social benefits received by implementing GAP will increase the reasons for or against adoption (Amare & Darr, 2023). Reasons for adoption (RFA) tend to shape positive attitudes, strengthen subjective norms, and increase perceived behavioral control. Meanwhile, reasons against adoption (RAA), which include the perception that coffee farming with GAP is expensive and requires high labour, will form negative attitudes (Pham et al., 2022; Cabeza-Ramírez et al., 2024). Therefore, it is assumed that BSF encourages RFA and reduces RAA, while RFA and RAA shape attitudes, subjective norms, and perceived behavioral control. Based on the explanations, the following hypotheses are proposed:

H1: Belief sustainable of farming have a positive influence on reasons for adoption.

H2: Belief sustainable of farming have a positive influence on reasons against adoption.

H3: Reasons for adoption have a positive influence on attitudes toward adoption GAP.

H4: Reasons for adoption have a positive influence on subjective norms.

H5: Reasons for adoption have a positive influence on perceived behavioral control.

H6: Reasons against adoption have a negative influence on attitudes toward adoption GAP.

H7: Reasons against adoption have a negative influence on subjective norms.

H8: Reasons against adoption have a negative influence on perceived behavioral control.

Confidence in increased harvests, environmental and social benefits received are parameters of farmer attitudes because they describe the perceptual and emotional evaluation of GAP implementation (Cahyono et al., 2020; Oumayma & Ez-Zohra, 2023). Encouragement from family, farmer groups, agricultural extension workers, and the government indicates subjective norms. These factors serve as pressure and social recognition sources, shaping farmers' intentions to adapt their behavior to the environment (Nguyen & Drakou, 2021; Laksono et al., 2022). Beliefs about the availability of agricultural resources and facilities, technical capabilities, and access to information and training are parameters of perceived behavioral control, as a supporter in overcoming obstacles and adopting GAP (Cahyono et al., 2020; Bracken et al., 2023). These three constructs contribute simultaneously to shaping intention as a mediator in shaping farmers' actual behavior in adopting coffee GAP (Ajzen, 2020; Dlamini et al., 2021). Four hypotheses are proposed as follows:

H9: Attitude have a positive influence on intention to adopt GAP.

H10: Subjective norm has a positive influence on intention to adopt GAP.

H11: Perceived behavioral control has a positive influence on intention to adopt GAP.

H12: Intention have a positive influence on the behavior of adoption GAP.

Based on this description, Fig. 2 summarizes the theoretical framework of this study.

RESULTS

Measurement Model Results

First, reliability is assessed using outer loading, Cronbach's alpha and composite reliability (Table 1).

The results demonstrated outer loading values above 0.7, reflecting how well the indicators represent their respective variables. This indicates strong reliability or internal consistency because Cronbach's Alpha and Composite Reliability (CR) values for all constructs were above 0.70 and less than 0.95. These results demonstrate that all study variables are reliable and provide consistent

Table 1: Results of reliability and validity tests of research constructs (outer loading, Cronbach's alpha, composite reliability, and AVE) using SEM-PLS

Indicator		Outer Loading	Cronbach's Alpha	CR	AVE
Belief sustainability of farming (BSF)					
BSF 1	Economic value	0.864	0.745	0.853	0.661
BSF 2	Environmental value	0.717			
BSF 3	Social value	0.849			
Reasons for adaption (RFA)					
RFA 1	Production benefits	0.818	0.784	0.871	0.693
RFA 2	Economic benefits	0.830			
RFA 3	Environmental benefits	0.850			
Reason against adoption (RAA)					
RAA 1	High cost	0.940	0.861	0.935	0.878
RAA 2	High time and labor	0.934			
Attitude (ATT)					
ATT 1	Attitude to increasing production	0.836	0.706	0.834	0.627
ATT 2	Attitude to environmental benefits	0.722			
ATT 3	Attitude to social benefits	0.813			
Subjective norms (SN)					
SN 1	Family support	0.851	0.826	0.884	0.657
SN 2	Farmers' group support	0.822			
SN 3	Agricultural extension support	0.822			
SN 4	Government support	0.744			
Perceived behavioral control (PBC)					
PBC 1	Resources availability	0.845	0.786	0.875	0.700
PBC 2	Knowledge and skills	0.800			
PBC 3	Training and access information	0.864			
Intention (INT)					
INT 1	Willingness to try	0.886	0.787	0.876	0.703
INT 2	Implementing	0.867			
INT 3	Long-term commitment	0.755			
Behavioral Adoption (ADPT)					
ADPT 1	Production input	0.811	0.766	0.849	0.584
ADPT 2	Conservation	0.785			
ADPT 3	Product diversification	0.732			
ADPT 4	Farmers' group activities	0.726			

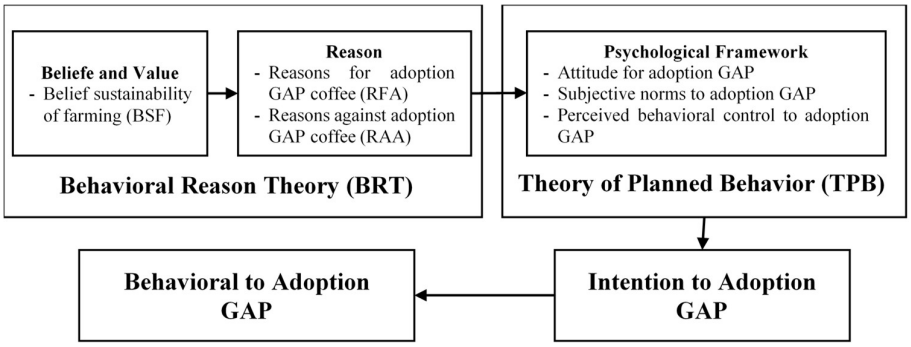

Fig. 2: Theoretical Framework of the Research.

answers (Hair et al., 2021; Ringle et al., 2023). Then, the model's validity was checked using the Average Variance Extracted (AVE) in Table 1 and the discriminant validity test results (Table 2).

Table 2: Results of the discriminant validity test (Fornell Larcker criterion and HTMT ratio)

		BSF	RFA	RAA	ATT	SN	PBC	INT	ADPT
Fornell–Larcker	BSF	0.813							
	RFA	0.372	0.833						
	RAA	0.463	0.214	0.937					
	ATT	0.496	0.428	0.323	0.792				
	SN	0.326	0.267	0.277	0.315	0.811			
	PBC	0.387	0.355	0.281	0.406	0.369	0.837		
	INT	0.537	0.276	0.665	0.339	0.290	0.304	0.838	
	ADPT	0.518	0.397	0.322	0.418	0.294	0.442	0.318	0.764
HTMT	BSF								
	RFA	0.455							
	RAA	0.569	0.266						
	ATT	0.688	0.537	0.409					
	SN	0.427	0.331	0.322	0.424				
	PBC	0.528	0.442	0.339	0.562	0.458			
	INT	0.697	0.357	0.798	0.452	0.355	0.385		
	ADPT	0.694	0.478	0.389	0.572	0.371	0.557	0.396	

The analysis results demonstrated that the AVE ≥ 0.5, value meets the requirements, meaning each construct has good convergent validity. Also, the square root of the AVE for each construct is larger than the correlation between other constructs, satisfying the Fornell-Larcker criteria. Furthermore, the HTMT values for all pairs of constructs are below the threshold of ≤ 0.85, confirming that each construct has clear conceptual differences (Hair et al., 2021; Ringle et al., 2023). These results demonstrate the importance of discriminant validity to ensure that the farmer behavior constructs in GAP adoption reflect distinct and non-overlapping psychological factors.

Structural Model Evaluation

Once the measurement model is reliable and valid, the next step is to check the structural model (Fig. 3) by following several connected steps. The findings from evaluating the structural model are presented in Table 3.

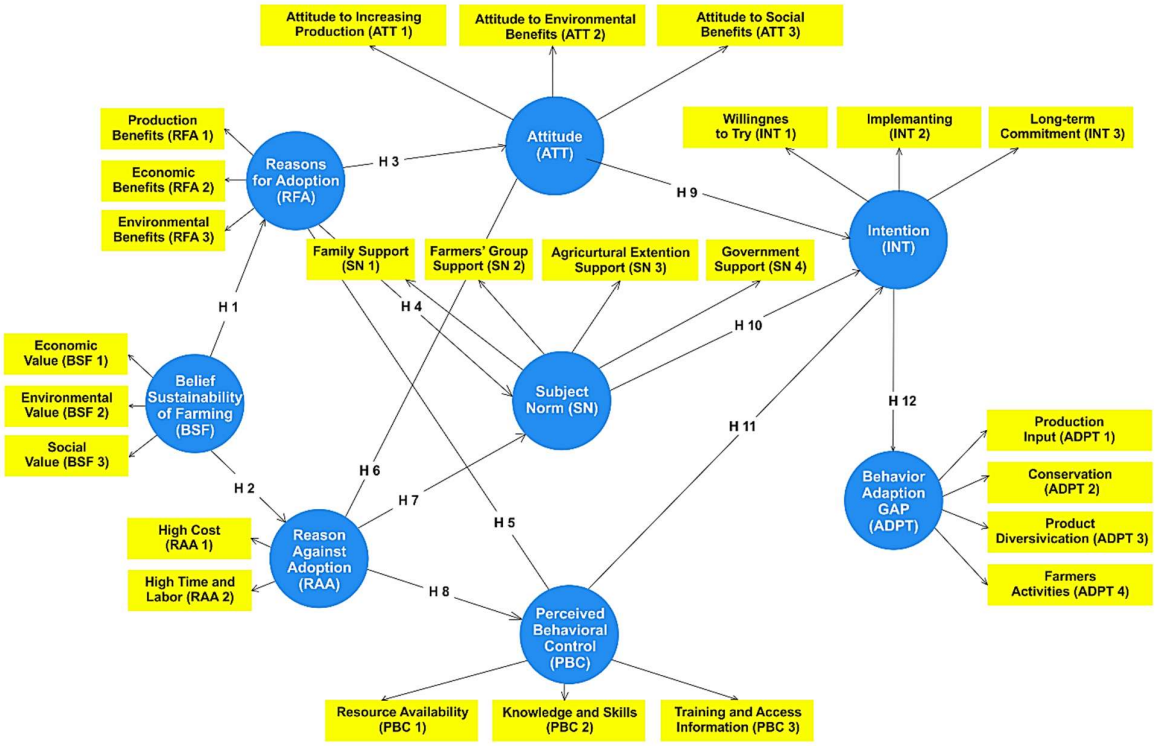

Fig. 3: Structural Model.

Table 3: Structural model evaluation results using SEM-PLS

Relationship between Variables	VIF	p-values (β)	t- statistics	Determinant Coefficient (R^2)	Predictive relevance (Q^2)
BSF -> RFA	1.000	0.000	7.647**	0.138	0.086
BSF -> RAA	1.000	0.000	9.979**		
RFA -> ATT	1.048	0.000	8.405**	0.214	0.185
RFA -> SN	1.048	0.000	4.291**		
RFA -> PBC	1.048	0.000	6.859**		
RAA -> ATT	1.048	0.000	4.684**	0.240	0.139
RAA -> SN	1.048	0.000	4.240**		
RAA -> PBC	1.048	0.000	4.314**		
ATT -> INT	1.245	0.000	3.691**	0.122	0.077
SN -> INT	1.203	0.001	3.240**	0.170	0.116
PBC -> INT	1.298	0.002	2.928**	0.170	0.112
INT -> ADPT	1.000	0.000	7.313**	0.101	0.053

First, the variance inflation factor (VIF) value is below 5, indicating there is no multicollinearity between variables (Hair et al., 2021). Second, testing the significance and strength of the relationship between variables using a bootstrapping test on 5,000 subsamples showed that all relationships between variables were significant at a 95% confidence level, with a p-value <0.05 (Ringle et al., 2023; Dybro Liengaard, 2024). The results of the analysis show that all hypotheses are accepted. Furthermore, the influence of variables is weak, as indicated by a coefficient of determination value below 0.25 (Hair et al., 2021). Fourth, the predictive relevance using blindfolding obtained Q^2 has a positive value, indicating the model's predictive relevance (Hair et al., 2021). Fifth, the standardized root means square residual (SRMR) value below 0.1 indicates that the overall model fit is in the moderate category, consistent with behavioral studies in the agricultural sector (Ringle et al., 2023).

The analysis demonstrates that farmers' beliefs in sustainable agriculture are important as a reason for or against coffee GAP adoption. Reasons for supporting GAP significantly influence attitudes, subjective norms, and perceived behavioral control. Meanwhile, reasons for opposing GAP negatively influence these three factors. Furthermore, these three factors influence farmers' intentions to adopt coffee GAP. Intention proved to be a strong direct predictor of GAP adoption behavior. This finding is consistent with the TPB framework, which emphasizes intention as a key mediator of behavior (Ajzen, 2020).

Importance-Performance Map Analysis (IPMA)

An Importance-Performance Map Analysis (IPMA) was conducted to identify the most important variables influencing GAP adoption intentions and behavior, while assessing the relative performance of each variable (Hauff et al., 2024). The first IPMA was for the intention variable (Fig. 4).

IPMA results for the intention variable indicate that attitude (ATT) toward intention (INT) to adopt GAP is highly important and has relatively moderate performance.

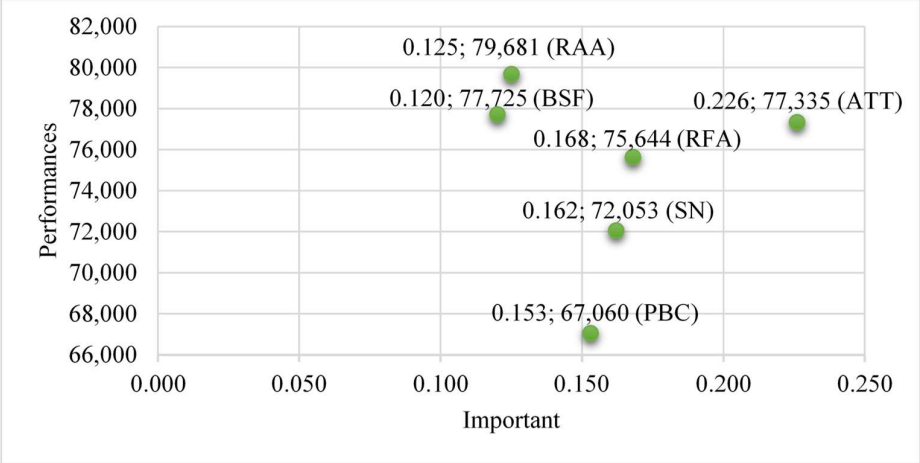

Fig. 4: IPMA component of intention to adopt GAP.

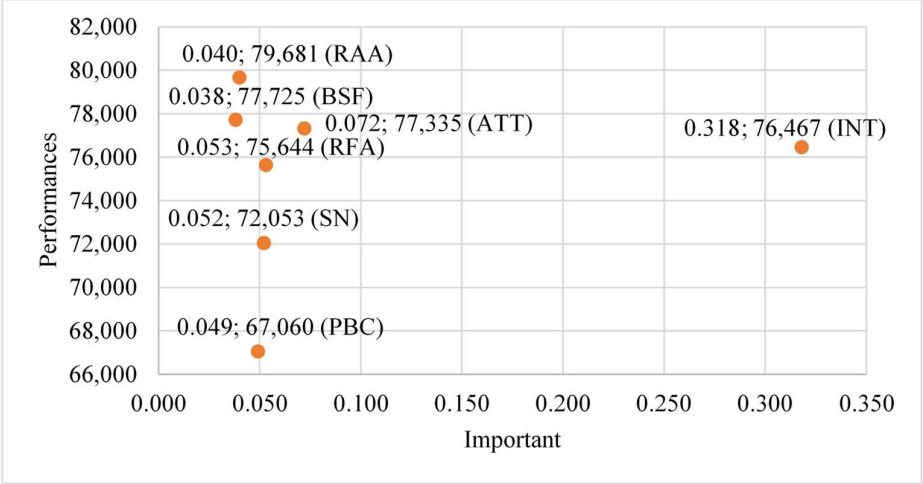

Fig. 5: IPMA of component behavior to adopt GAP.

The IPMA analysis of the adoption behavior variable (ADPT) shows that adoption intention (INT) is the most important variable, but its performance is not optimal. Meanwhile, the intention variable is influenced by attitudes, subjective norms, and perceived behavioral control. This confirms the intention variable as the primary link between psychological factors and farmer behavior, which is key to the transformation towards sustainable agriculture. This situation requires intervention strategies focused on improving farmer intentions, resulting in more consistent adoption of GAP.

DISCUSSION

This study proves that the adoption of coffee GAP can be strengthened through an approach to farmers' socio-psychological factors. Farmers perceive that the implementation of GAP in coffee cultivation enhances productivity, leading to higher yields and improved quality. In addition, GAP practices generate long-term ecological benefits by maintaining soil fertility, minimizing erosion, reducing environmentally harmful chemical residues, and lowering overall production costs (Akrong et al., 2022; Amare & Darr, 2023; León Chilito et al., 2024). These production, environmental, and economic advantages function as strong "reasons for" adoption within the Behavioral Reasoning Theory framework, thereby reinforcing farmers' intentions and decisions to adopt sustainable agricultural practices (Han & Niles, 2023; Swart et al., 2023; Sia et al., 2025).

Meanwhile, the reasons against construct negatively influence farmers' intentions to adopt GAP, as expected within the Behavioral Reasoning Theory framework. Interestingly, however, this study finds that reasons against exert a positive effect on attitudes, subjective norms, and perceived behavioral control (PBC). Farmers recognize that implementing GAP requires additional time and effort, particularly for pruning, sanitation, and selective red picking, which increases labor requirements and production costs (Grandez-Alberca et al., 2025). These perceived barriers, rather than discouraging adoption, appear to trigger a more deliberate cognitive evaluation in which farmers weigh short-term costs against long-term agronomic, economic, and environmental benefits. As a result, reasons against can strengthen attitudes, enhance perceived behavioral control, and reinforce social influences when farmers conclude that the benefits ultimately outweigh the sacrifices. This finding suggests that reasons against are not merely sources of resistance but also part of a reflective cognitive process that shapes beliefs, perceptions of control, and subsequent behavioral evaluations (Han & Niles, 2023; Westaby et al., 2025).

The adoption of coffee GAP is shaped not only by technical and economic considerations but also by farmers'

perceptions of the introduced innovations and technologies. The characteristics of the innovation, together with individual psychological and demographic attributes, play an important role in shaping adoption decisions (Rizzo et al., 2024). In this context, BRT provides an initial reasoning framework that guides farmers' evaluative and cognitive processes, which subsequently influence their intentions and actual behaviors (Xu et al., 2024Westaby et al., 2025).

Farmers' positive attitude towards GAP is shown in their farming system, because farmers are confident that they will get better harvests, sustainable farming environments, and build a conducive social environment (Cahyono et al., 2020; Akrong et al., 2022). Family encouragement to earn a good income is crucial in farmers' adoption of GAP. Advice and input from farmer groups and agricultural extension workers are positive, especially for farmers active in farmer groups (Onyemekonwu et al., 2021). Institutional regulations and norms influence attitudes towards GAP adoption (Ahmed et al., 2022). Meanwhile, government support is also positive for farmers, although limited to assistance and fertilizer subsidies for certain types (Nguyen & Drakou, 2021; Laksono et al., 2022). Farmers' experience in farming can increase their knowledge and skills, which will influence GAP adoption. Furthermore, farmers' confidence in resource ownership and ease of access to information can increase their perception of behavioral control over GAP adoption (Cahyono et al., 2020; Grandez-Alberca et al., 2025). This proves that the psychological factors of farmers, including attitudes, subjective norms, and perceived behavioral control, which shaped farmers' intentions to adopt Coffee GAP (Wibowo et al., 2022; Swart et al., 2023; Zhang et al., 2024).

Intention is a link between psychological constructs and farmers' behavior in adopting GAP (Nguyen & Drakou, 2021; Putri et al., 2025). Although this relationship is significant, the contribution of intention to actual behavior is still limited. This situation still needs to be addressed by strengthening farmers' internal perceptions and motivations, thereby increasing their intention to adopt GAP coffee. Methods for improving farmer attitudes can be implemented by demonstrating concrete evidence from an economic, environmental, and social perspective. Meanwhile, improving farmers' perceptions of behavioral control can be achieved by developing their capacity through training, expanding access to technological information, and increasing farmer participation in farmer empowerment programs (Pham et al., 2022; Nanyonjo & Nchanji, 2023). Subjective norms can be strengthened by optimizing the empowerment of farmer groups and mentoring by agricultural extension workers, as well as supporting government policies such as subsidies and credit access regulations, and building a conducive business environment (Onyemekonwu et al., 2021; Kusnandar et al., 2023; Wright et al., 2024). This strategy is carried out to increase farmers' confidence and perception, and encourage them to implement sustainable farming.

The findings of this study confirm that farmers' beliefs about the sustainability of coffee cultivation practices form the foundation for cognitive and emotional reasons that support or hinder GAP adoption (Rasheed et al., 2023). These reasons influence farmers' attitudes, prevailing social norms, and perceived ability to adopt GAP. These constructs shape farmers' intentions, which drive actual behavior in sustainable cultivation practices (Sok et al., 2021; Westaby et al., 2025). The findings of this study confirm that integrating the TPB and BRT has a hierarchical relationship where cognitive reasons underlie behavioral intentions and decisions (Cabeza-Ramírez et al., 2024).

This study provides important implications for improving farmers' adoption behavior towards GAP coffee. First, this study demonstrates that attitude is the most important factor in increasing farmer intention. Meanwhile, farmer motivation and belief are of moderate importance, and their performance needs to be improved by maintaining the variables of reasons for and against, as well as the farmers' belief in GAP coffee adoption. This is because the variables that make up BRT are initial reasoning factors that emphasize the rational understanding process with cognitive and emotional reasons that lead to intentions and behavior. Increasing farmers' intentions to adopt GAP coffee focuses on maintaining and improving farmers' cognitive and emotional factors. Second, intention emerged as the most important predictor of adoption behavior, but its performance is still moderate. This indicates the need for strategies that transform intentions into concrete behavior.

The findings of this study also serve as a driver for achieving the Sustainable Development Goals (SDGs), particularly contributing to SDGs 2 (Zero Hunger) by increasing food productivity and quality; environmentally friendly agricultural practices support the achievement of SDGs 12 (Responsible Consumption and Production) and SDGs 13 (Climate Action). This is because smallholder farmers produce the majority of agricultural products (Vishnoi & Goel, 2024). Therefore, effective interventions should not only strengthen socio-psychological dimensions but also provide technical support and institutional incentives to ensure that the transition to GAP practices is continuous, sustainable, and capable of generating tangible impacts on environmental sustainability and farmers' welfare (Amrulloh et al., 2024). This study confirms that strategies to increase farmer capacity, provide incentives, and strengthen institutions can encourage wider adoption of GAP, while simultaneously supporting the sustainability of the global food system.

Conclusion

This study demonstrates that integrating Behavioral Reasoning Theory (BRT) with the Theory of Planned Behavior (TPB) offers a more comprehensive explanation of the socio-psychological factors influencing smallholder coffee farmers' adoption of GAP. The findings confirm that attitudes, subjective norms, and perceived behavioral control shape intentions. The reasons for and against adoption, derived from BRT, serve as the cognitive foundation of these constructs. Although intention is a key mediator of adoption behavior, its translation into practice is constrained by external barriers. Limited resources, high perceived costs, and inadequate institutional support are among these barriers.

The contribution of this study lies in showing that

accelerating GAP adoption requires a dual strategy. For farmers, the results underscore that adoption is not solely an individual decision; instead, it depends on social support and resource accessibility. For academics, the integration of BRT and TPB within the Sustainable Development Goals framework advances behavioral theory in the context of agricultural innovation. For policymakers, the study provides empirical evidence to design more effective programs, emphasizing the need to combine behavioral change strategies with enabling policies to foster sustainable farming systems. While this study contributes to a deeper understanding of GAP adoption and the socio-psychological factors influencing it, several limitations should be acknowledged. The analysis is restricted to a specific geographic area and coffee commodity, which limits the generalizability of the findings to other contexts. Accordingly, future research is encouraged to conduct comparative studies across different regions and agricultural commodities, as well as to employ mixed-method approaches to capture socio-psychological dimensions that are difficult to measure quantitatively. Such efforts will strengthen the robustness of the evidence base and enhance the applicability of the findings across broader agricultural settings.

DECLARATIONS

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Conflict of Interest: The authors declare no conflict of interest.

Data Availability: All the data are available in the article.

Ethics Statement: The authors confirm that this research was conducted in accordance with ethical research standards. Data were collected through field surveys and secondary sources with due consideration to confidentiality and informed consent. The study did not involve experiments on humans or animals and therefore did not require formal ethical clearance.

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Generative AI Statement: The authors declare that no Gen AI/DeepSeek was used in the writing/creation of this manuscript.

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