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Fostering entrepreneurial intentions among millennial farmers in the agricultural sector: An extended theory of planned behavior approach

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Abstract

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This study explores the factors that affect entrepreneurial intentions among millennial farmers in Sleman Regency, Special Region of Yogyakarta. Using an expanded Theory of Planned Behavior (TPB) framework, this study adds entrepreneurial literacy and entrepreneurship training as additional variables. This study involved 497 millennial farmer respondents from 17 sub-districts in Sleman Regency, and was analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM). Key findings suggest that Perceived Behavioral Control (PBC) significantly mediates the relationship between attitudes, subjective norms, and entrepreneurial intentions. Entrepreneurship training has a more significant impact on PBC than entrepreneurial literacy, demonstrating the importance of practical skills in building the confidence of millennial farmers. Positive attitudes towards entrepreneurship substantially affect PBC and entrepreneurial intentions, while subjective norms only affect PBC without directly impacting intention. This research provides practical insights for policymakers and educational institutions to develop more effective entrepreneurship training programs to increase the involvement of millennial farmers in agribusiness.

Keywords: agricultural regeneration; entrepreneurial intentions; entrepreneurial literacy; entrepreneurship training; perceived behavioral control; theory of planned behavior

Introduction

Until now, agriculture is still recognized as having a central role in stabilizing food availability and security in various countries (Grote, 2014; Waha et al., 2018). This is because agriculture plays a direct role in the provision of food (Waha et al., 2018), supporting the livelihoods of many people in the world, especially in rural areas (Liu et al., 2024), to be able to overcome the impact of climate change if managed adaptively and sustainably (Howden et al., 2007). As evidence, in 2023, agriculture in developing countries will account for around 25 % of total global employment, and even 70% of the world's food production will come from the smallholder agriculture sector (FAO, 2023). In addition, World Bank data shows that about 60% of the global rural population works in the agricultural industry, which is the main economic driver in these regions (World Bank, 2022). Furthermore, in Sub-Saharan Africa, more than 70% of the workforce is directly involved in agricultural activities (World Bank, 2022). No less important is the IPCC data, which reveals that farming systems that adopt green technologies and sustainable practices can reduce greenhouse gas emissions by 30%, even with sustainable agriculture, which can increase productivity by up to 25% in climate-prone areas (IPCC, 2023). Based on the data mapping above, it prioritizes improving agricultural infrastructure, extension, and motivating farmers (Lantarsih et al., 2021; Mouratidis and Poortinga, 2020; Muti'ah and Lantarsih, 2022) and increasing the purchasing power of

farmer households (Pawlak and Kołodziejczak, 2020), is the leading and essential choice.

The above phenomenon hints at a bright future for the development of the agricultural sector. However, academic literature has also shown the various challenges the farming sector has faced recently. For example, prolonged extreme weather that causes an increased risk of crop failure (Shahzad and Abdulai, 2020), Agricultural land conversion (Anggalini et al., 2020), urbanization, and the high interest of the young generation to migrate (Manalo and Fliert, 2013), to the labor crisis exacerbated by the aging of farmers and the low interest of the younger generation to enter this sector (Bădan and Fîntîneru, 2022; Christiaensen et al., 2021; McKillop et al., 2018). In addition, the negative perception of agriculture as an unpromising sector makes it more challenging to regenerate a competent workforce (Henning et al., 2022; Maulida et al., 2022). These problems are even more worrying because they create labor shortages in agriculture and impact landowners (Nugroho et al., 2018). As a result, there has been an increase in wages and a decrease in agricultural production, so the farming sector is increasingly lagging in utilizing the latest technology (Kurbatova et al., 2020; Moreda, 2023). The growing literature on solutions to these challenges often focuses only on efforts to increase productivity through conventional agricultural policies (Reimer et al., 2023). Moreover, although there has been the development of innovative farming systems, most of them are still descriptive and focused on technical aspects (Osrof et al., 2023; A. Yousaf et al., 2023), not on the side of entrepreneurship or agripreneurship (Higgins et al., 2018; Seuneke et al., 2013; Ulvenblad et al., 2020). Thus, according to Condor (2020), entrepreneurship in the agricultural sector must be practiced immediately.

Scholars' studies have paid much serious attention to the entrepreneurial sector. Serious attention to entrepreneurship because it has been proven to be able to alleviate poverty (Si et al., 2020), minimizing unemployment (Geza et al., 2021), stimulating employment (Kumar and Raj, 2019), to promote sustainable economic growth (Galindo et al., 2020). One of the latest breakthroughs in the entrepreneurship sector is agricultural entrepreneurship for the younger generation, which is believed to have superior prospects and performance when applied to a program (Adeyanju et al. 2021; Geza et al., 2021). There is a positive response and policy from the government in developed and developing countries about the importance of youth entrepreneurship in agriculture (Audretsch and Moog, 2022). Especially in Indonesia, the government, through the Ministry of Agriculture of the Republic of Indonesia, is trying to increase the number of young farmers, and it is projected to reach 2.5 million by 2024 (Zhang et al., 2023). In addition, programs such as Young Agricultural Entrepreneurs (PWMP), Millennial Farmer Ambassadors, Mainstay Farmer Ambassadors, the implementation of agrarian digitalization, and the Youth Entrepreneurship and Employment Support Service (YESS) program, which is the result of collaboration between the Ministry of Agriculture of the Republic of Indonesia and the International Fund for Agricultural Development (IFAD), all aim to develop regeneration in the agricultural sector (Anwarudin et al., 2020; Daminih et al., 2023; Sudirwo et al., 2023; Supriyadi, 2023). Through these programs, it is hoped to realize advanced, independent, and modern agricultural regression. Recent studies from (Misbach, 2023) also show that the YESS program is proven to be able to improve people's welfare.

Entrepreneurship can be a driving force for the transformation of the agricultural sector, especially in attracting the younger generation back to the industry (Brooks et al., 2013; Santiago and Roxas, 2015). The next challenge encountered is entrepreneurial intention, which is one of the determinants of business success at the beginning. Empirical evidence shows that many factors influence entrepreneurial intentions among young farmers related to personal competence, entrepreneurial exposure, contextual elements (Gulzar and Fayaz, 2023), self-motivation, family support, peer influence, institutional support (Martins et al., 2023; Roos and Botha, 2022), Entrepreneurial orientation (Hassan et al., 2021), perceived behavioral control, attitudes towards entrepreneurship, and training (Suwanan and Allya, 2023; Tambwe et al., 2020). However, the agricultural sector still needs to be considered a less-than-ideal sector to be developed through entrepreneurship, especially among the younger generation. This is due to low-profit margins and high dependence on natural factors such as weather (Widiyanti et al., 2018). In addition, the stigma is that the agricultural sector is more traditional and offers little development compared to other sectors, such as the information technology or creative industry (Milovanovic, 2014). Urbanization and migration of the younger generation to big cities also cause the agricultural sector to be often abandoned and considered incompatible with modern lifestyles (Ajekwe and Ibiamke, 2020). Finally, limited access to capital and adequate training is also a significant obstacle for youth to entrepreneurship in agriculture (Adeyanju et al., 2021; Ahmed and Ahmed, 2021; Babu and Zhou, 2020; Ouko et al., 2022). Thus, testing the in-depth role of entrepreneurial literacy and entrepreneurship training is the key to increasing the intention of the younger generation to be entrepreneurial in this field.

Based on the mapping of the problems above, this study will explore the factors that affect entrepreneurial intentions

in the agricultural sector for the millennial generation in Indonesia. For its theoretical foundation, this study adopts the theory of planned behavior (TPB), which Ajzen and Driver (1991) recommended. At the same time, it is used to model the framework of this research. In addition to using the components of the TPB, such as attitudes, subjective norms, and control of perceived behavior, this study also uses entrepreneurial literacy and entrepreneurship training as an extension of the TPB in reviewing the entrepreneurial intentions of the millennial generation in Indonesia, especially in the agricultural sector. Much academic literature uses the TPB to analyze intentions-related matters (Armitage and Conner, 2001). Furthermore, *scholars* have also used many variables of entrepreneurial literacy and entrepreneurship training to identify entrepreneurial intentions, such as Alfianti et.al. (2021), Azis (2023), and Solihin (2023), which focuses on entrepreneurial literacy, and Boukamcha (2015), Chen et. al. (2015), and Farashah (2013) which focuses on entrepreneurship training. The severe assessment conducted by the *scholars* shows the importance of these variables in identifying the subject's intention in entrepreneurship. In this study, combining the components of TPB, entrepreneurial literacy, and entrepreneurship training as an extended TPB is the novelty of this research. In addition, attitudes modeled as mediation variables aim to enrich the analysis in this study. For that, this research is expected to provide new insights into developing the interest of the younger generation in entrepreneurship in the agricultural sector in Indonesia.

The expected practical contributions to this research are more effective entrepreneurship education and training programs in the agricultural sector. Second, more precise policy-making to provide support for agricultural entrepreneurship. Third, this research is expected to provide valuable information for organizations and extension institutions in designing effective marketing strategies to attract the millennial generation's interest. This study first presents the theoretical background, hypothesis, and research model in part 2. The research motto is described in part 3, while the results of the research and discussion are presented in parts 4 and 5. Finally, the conclusion is given in part 6.

Theoretical foundations and research hypotheses

Theory of planned behavior and intention entrepreneurship

In recent years, Planned Behavior Theory (TPB) has become a framework often used to examine behavioral intentions and the influence of psychosocial factors on actual behavior across various disciplines (Andika et al., 2023; Li et al., 2024; Shetu, 2024), including the agriculture and rural development sectors (Khazami et al., 2023). The TPB assumes that a person's positive attitude towards a subject or situation will encourage them to evaluate the subject or situation positively, ultimately affecting their behavior (Ajzen, 1991). However, along with the widespread implementation of the (Ajzen, 2020; Bosnjak et al., 2020; Sun, 2020), There are still challenges in predicting behavior consistent with intent. Some studies show that positive intentions are not always followed by concrete actions, which raises the need to expand the model of the TPB by adding new elements to improve behavior prediction (Ali et al., 2023; Kopaei et al., 2021).

Although the TPB has shown its effectiveness in a variety of contexts, some experts argue that this model has limitations, such as Sniehotta et.al. (2014), Khan et al. (2020), especially in explaining youth participation in the agricultural sector (Zaremohzzabieh et al., 2022). Zhang dan Wang (2024) emphasizes that the three original factors of the TPB may not be sufficient to capture all the relevant variables in this context. Moreover, Aga (2023) and Talukder et. al. (2024) highlight the importance of behavioral control in strengthening the relationship between Intention and behavior, which is strongly influenced by factors such as knowledge and resources. In response to these criticisms, the study not only maintains the core elements of the TPB – namely behavioral intentions, attitudes toward behavior, subjective norms, and perception of behavioral control, but also expands on them by including variables that are more appropriate to the context of youth participation in agriculture.

As the TPB explains, the intention to perform a behavior directly predicts that behavior (Ajzen, 1991). Therefore, understanding intentions is crucial, especially in contexts where actual behavior is difficult to observe or has yet to occur (Ajzen, 2020). In the context of this study, the exact behavior of millennial farmers, such as their involvement in agricultural entrepreneurship, has not yet been fully realized, so it is essential to predict their intentions as a first step. This study expands the TPB by including additional variables such as training and entrepreneurship literacy.

The addition of this variable is very relevant because entrepreneurial training and literacy not only strengthen Perceived Behavioral Control (PBC), but also significantly influence increasing entrepreneurial intentions through strengthening PBC. Entrepreneurship training equips individuals with essential practical skills and technical knowledge, which can enhance their ability to overcome challenges in running a business and improve their confidence in controlling their business results (Galvão et al., 2020). This increased confidence reinforces PBCs, which are essential in influencing entrepreneurial intentions, as they feel better prepared and able to face obstacles that may arise (Yousaf et al.,

2020). Entrepreneurial literacy, on the other hand, enriches farmers' understanding of risk management, business planning, and innovation (Guampe et al., 2022). This increase in literacy strengthens PBC by strengthening individuals' confidence in their ability to manage businesses effectively (Wardana et al., 2020). However, the impact of entrepreneurial literacy on entrepreneurial intentions occurs indirectly but through a higher PBC (Abdelwahed et al., 2023). Therefore, integrating entrepreneurship training and literacy into the TPB model is expected to provide deeper insights into the determinants of entrepreneurial intentions among millennial farmers and provide a solid empirical foundation for policy interventions aimed at increasing entrepreneurship in the agricultural sector.

Elements of TPB

Perceived Behavioral Control and Intention

Perceived Behavioral Control (PBC) in the Theory of Planned Behavior (TPB) refers to an individual's beliefs about their ability to carry out a behavior, which is influenced by the availability of resources and the opportunities they perceive (Ajzen, 2002)**.** PBC is significant in predicting a person's intentions; the more critical the control felt, the stronger the individual intends to carry out the behavior (Ajzen, 1991). For millennials who have worked as farmers, PBC can arise from the belief that they have the knowledge, skills, and access to resources necessary to transform conventional farming practices into more business-oriented ventures (Astuti et al., 2023). The high level of PBC increases their confidence in facing challenges and taking advantage of opportunities in entrepreneurship, which ultimately strengthens their intention to transform into entrepreneurial farmers (Badghish et al., 2023). As such, PBC not only serves as a predictor of intent, but also as a significant driver in millennial farmers' decisions to adopt an entrepreneurial approach.

Previous research has highlighted the importance of PBC in shaping entrepreneurial intentions, especially among millennial farmers. Results of Ezeh (2023) shows that PBC strongly correlates to cultivating agricultural product entrepreneurship among youth without any difference between women and men. In Indonesia, a study by Suwanan and Allya (2023) found that millennial farmers with high PBC are likelier to try agricultural innovation and develop their businesses into more commercial ones. Other research by Mubarak et al. (2022) also emphasized that PBCs play a vital role in the successful transition from conventional farmers to entrepreneurs, especially in environments with high economic challenges. These findings reinforce the understanding that PBC is not only influential in shaping entrepreneurial intentions, but also a critical factor in the success of entrepreneurial practices in the agricultural sector (Figure 1). Based on these findings, we hypothesize that:

H1: A high PBC will significantly increase millennial farmers' IntentionIntention to transform into entrepreneurial farmers.

Attitudes, PBC, and intention

Attitudes toward a behavior reflect an individual's evaluation of the impact of the action, both positive and negative, and the extent to which the effect is considered necessary by the individual (Fishbein and Ajzen, 1983). This attitude shapes intentions and perceived behavioral control (PBC) (Lv et al., 2024). Individuals with a positive attitude towards a behavior tend to be more motivated to carry it out and feel more able to control the factors that affect its implementation (Glasman and Albarracín, 2006). In the context of millennial farmers, a positive attitude towards agricultural entrepreneurship is driven by the belief that these activities will

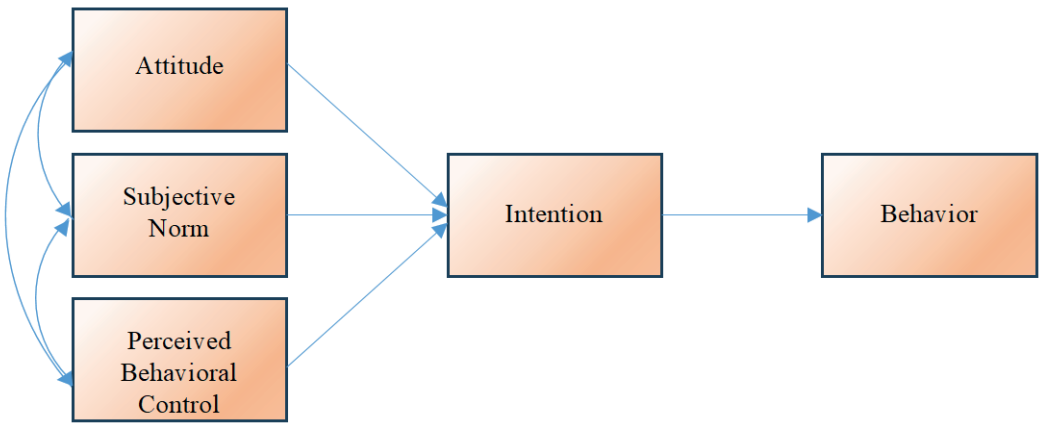

Fig. 1. Theory of planned behavior
Source: Authors' own elaboration

provide tangible benefits, such as increased income, innovation, and broader market access (Devkota et al., 2021). This positive attitude not only encourages farmers' intentions to be involved in entrepreneurship (Devkota et al., 2021), but also reinforces their perception of the ability to control the factors that affect success (Liang and Chen, 2021). Along with the increase in positive attitudes, farmers' confidence in facing challenges and managing resources is also increasing (Hartmann et al., 2022), strengthening their PBC. Thus, a positive attitude is the primary foundation that boosts confidence and behavioral control, directly affecting millennial farmers' Intention to become innovative and competitive agricultural entrepreneurs.

Previous research has shown that a positive attitude towards entrepreneurship has a significant influence on PBC and entrepreneurial intentions, especially in the context of agriculture. Liang and Chen (2021) found that this positive attitude serves as a critical driver that not only increases an individual's intention to start a venture, but also strengthens their belief in the ability to overcome obstacles. More specific research on young farmers by Dong et al. (2022) and Lediana et al. (2023) revealed that entrepreneurship education and access to market information reinforce positive attitudes, directly improving PBC and entrepreneurial intentions. Thus, a positive attitude towards entrepreneurship not only increases entrepreneurial intentions, but also strengthens PBC, making young farmers more prepared and confident in carrying out business transformation. Based on these findings, we hypothesize that:

H2: Positive attitudes towards entrepreneurship are directly related to the increase in PBC (a) and entrepreneurial intention (b) among millennial farmers.

Subjective norms, PBC and intention

Subjective norms refer to an individual's perception of the views and expectations of significant people around them, such as family, friends, or co-workers, about whether they should perform an Action (Fishbein and Ajzen, 1975). This norm is formed from the individual's belief in the importance of these social expectations and the desire to fulfill them (Gross and Vostroknutov, 2022). In entrepreneurship, millennial farmers are more motivated if they feel their social environment supports or expects such a move (Kaki et al., 2023). This subjective norm not only influences entrepreneurial intentions, but also reinforces individuals' belief in their ability to succeed in the act (Ephrem et al., 2021). In societies that embrace collectivist values, such as Indonesia, subjective norms have a more substantial influence because social pressures and group expectations play an essential role in decision-making (Wardana et al., 2024). When millennial farmers feel supported by their social environment, their confidence increases because social support reinforces the belief that they have the necessary abilities and resources to meet entrepreneurial challenges (Lv et al., 2024). Therefore, subjective norms not only strengthen entrepreneurial intentions but also increase individual confidence in overcoming obstacles. This shows how subjective norms and PBCs influence entrepreneurial decisions among millennial farmers, an increasingly relevant interaction amid rapid social change and increasing pressure for innovation in the agricultural sector.

Previous research has reinforced the critical role of subjective norms in shaping intentions and perceived behavioral control (PBC) in the context of entrepreneurship, although their influence on intentions is not always consistent and often depends on the cultural context (Chin et al., 2024; Lv et al., 2024; Wijayati et al., 2021). A study by La Barbera and Ajzen (2021) shows that subjective norms can influence an individual's intention to engage in certain behaviors, especially in a society that adheres to collectivist values, such as Indonesia. More recent research by Pham et al. (2023) also highlights that subjective norms are essential in strengthening PBCs, which can ultimately influence entrepreneurial intentions in a rapidly changing social context. In the context of young farmers, social support from family and friends often strengthens PBC, even when its influence on intentions is not always significant (Vasileiou et al., 2023). Ephrem et al. (2021) emphasized that in collectivist cultures, subjective norms tend to reinforce an individual's belief in succeeding in entrepreneurship, primarily through increased PBC. Therefore, while subjective norms do not necessarily directly affect intentions, in specific cultural contexts, such as Indonesia, subjective norms play an essential role in strengthening an individual's beliefs and readiness to overcome entrepreneurial challenges. Thus, it can be hypothesized that:

H3: Subjective Norms are directly related to the increase in PBC (a) and entrepreneurial intention (b) among millennial farmers

Extended TPB variables

Entrepreneurship training and PBC

Entrepreneurship training is a strategic initiative that aims to equip individuals with practical and theoretical skills through formal and informal education (Martin et al., 2013), which can significantly increase confidence in starting a business. The program plays a vital role in shaping individuals' perceptions regarding their ability to effectively control and carry out entrepreneurial activities (Yousaf et al., 2020). For millennial farmers, this training not only strengthens

their confidence and capacity to start a business, but also provides conceptual resources and competencies essential for business success in the agricultural sector (Galvão et al., 2020). The program's primary focus includes the development of critical skills, such as identifying market opportunities, understanding market dynamics, managing risk, and optimizing resource management (Sampedro-Hernández and Vera-Cruz, 2017). In recent years, these programs, organized by governments and external agencies, have contributed significantly to improving farmers' knowledge and skills (Opolot et al., 2018). From the point of view of social psychology, an individual's perception of themselves and their surrounding environment is highly influential in determining their behavior and response to entrepreneurial opportunities and challenges (Li et al., 2023). Therefore, entrepreneurship training effectively enhances the PBC of millennial farmers by empowering relevant knowledge and skills, which in turn drives an increase in entrepreneurial intention among them.

Previous research has confirmed that entrepreneurship training has a significant impact on PBCs. For example, a study by Bohlayer and Gielnik (2023) showed that entrepreneurship trainees with a high error mastery orientation experienced a considerable increase in PBC after participating in an intensive training program. In addition, research by Chalayonnavin (2024) also found that comprehensive entrepreneurship training for young women in Thailand significantly increased their confidence in their ability to manage a business, ultimately increasing their intention to be entrepreneurial. Based on these findings, the hypotheses proposed in this study are:

H4: Entrepreneurship training is directly related to the increase in PBC among millennial farmers.

Entrepreneurship literacy and PBC

Entrepreneurial literacy, which includes a deep understanding of business management, risk management, and innovation (Pérez-Bustamante, 2014), is crucial in increasing entrepreneurial intentions. As a means to improve literacy, entrepreneurship counseling programs have proven effective in strengthening entrepreneurial readiness by increasing individual confidence in their ability to start and manage businesses independently (Ugwuanyi et al., 2023). This is very relevant for millennial farmers, because counseling not only provides practical knowledge about farming business management but also strengthens confidence in facing entrepreneurial challenges and risks (Soomro and Shah, 2022). With the entrepreneurial literacy gained through this extension program, farmers can design better strategies to manage risks and optimize resources, thereby significantly improving their perceived behavioral control (PBC) (Ndofirepi, 2020). Conversely, without adequate extension programs, farmers may be trapped in less efficient traditional business practices, such as unstructured financial management and marketing, which ultimately increases the risk of business failure (Wardana et al., 2020). Therefore, increasing entrepreneurial literacy through counseling programs will encourage millennial farmers to feel more capable and ready to start entrepreneurship, ultimately strengthening their intention to start a business.

Previous research has proven a positive relationship between entrepreneurial literacy and PBC. For example, a study by Puni et al. (2018) found that farmers with a higher acquisition of entrepreneurial knowledge showed stronger PBCs when facing the challenges of agricultural business. More studies by Hu et al. (2021) also indicate that enhanced entrepreneurial literacy through education and training significantly strengthens individual PBCs in entrepreneurship. Based on these findings, the hypotheses proposed in this study are:

H5: Entrepreneurial Literacy is directly related to the increase in PBC among millennial farmers.

The mediating effect of PBC

Attitude, PBC and intention

PBC is essential in strengthening the relationship between entrepreneurial attitudes and intentions in millennial farmers (Dong et al., 2022). A positive attitude toward entrepreneurship does not always directly encourage the intention to be entrepreneurial. On the contrary, belief in overcoming obstacles is the determining factor in realizing these intentions Martín-Navarro et al. (2023) and Lv et al. (2024). Thus, an attitude that supports entrepreneurship becomes more meaningful and practical when farmers feel able to act. Previous research has emphasized the importance of PBC as a mediator that strengthens entrepreneurial intentions, especially in the context of the uncertainties that young farmers often face (Liang and Chen, 2021). Therefore, our hypothesis states that:

H6: PBC significantly mediates the relationship between positive attitudes and entrepreneurial intentions in millennial farmers.

Subjective norms, PBC, and intention

In the context of millennial farmers, more than subjective solid norms are needed to encourage entrepreneurial intentions with confidence that they can overcome the challenges (Bulsara and Sharma, 2023; Lv et al., 2024). Social norms that enable individuals to meet community expectations will only significantly impact entrepreneurial intentions if the individual has a high PBC (Pham et al., 2023). Previous studies

confirm that PBC acts as an essential mediator, reinforcing the influence of subjective norms on entrepreneurial Intention when PBC is high (Ephrem et al., 2021; Lechuga Sancho et al., 2020) (Figure 2). Thus, the hypothesis proposed is:

H7: PBC significantly mediates the relationship between subjective norms and entrepreneurial intention in millennial farmers.

Entrepreneurship training, PBC, and intention

Training is essential to encourage increased entrepreneurial intentions, especially among young farmers (Lediana et al., 2023). However, the effectiveness of this training depends not only on the transfer of knowledge and skills but also on the ability of the training to strengthen individual PBCs (van Esch et al., 2022). PBC, which reflects self-confidence in facing entrepreneurial challenges, is critical in determining whether the training successfully increases entrepreneurial intentions (Bhatti et al., 2021). Empirical studies show that practical entrepreneurship training can increase PBC, which contributes directly to strengthening entrepreneurial intentions (Doan and Phan, 2020; Hu et al., 2021). Therefore, it can be assumed that PBC is a crucial mediator in the relationship between entrepreneurship training and entrepreneurial intent, where increasing PBC through training will significantly strengthen entrepreneurial intentions in millennial farmers. Thus, we hypothesize that:

H8: PBC significantly mediates the relationship between entrepreneurship training and entrepreneurial intention in millennial farmers.

Entrepreneurship literacy, PBC and intention

Increasing entrepreneurial literacy not only broadens individuals' understanding of business concepts and strategies, but also strengthens their confidence in their ability to succeed in running a business (Pham et al., 2023). In line with Planned Behavior Theory, entrepreneurial literacy strengthens Perceived Behavioral Control (PBC) by equipping individuals with better knowledge in managing risk, identifying opportunities, and making informed decisions (Motta and Galina, 2023). In line with Planned Behavior Theory, entrepreneurial literacy strengthens Perceived Behavioral Control (PBC) by equipping individuals with better knowledge in managing risk, identifying opportunities, and making informed decisions (Nayak et al., 2024). Previous research has shown that individuals with high entrepreneurial literacy tend to have stronger PBCs, increasing their intention to be entrepreneurial (Soomro and Shah, 2022). In the context of growing entrepreneurial intentions, Amani et al. (2024) also found that entrepreneurial literacy through formal education significantly strengthened PBC, which functioned as a critical mediator in increasing students' entrepreneurial intentions. Based on these findings, we assume that extension

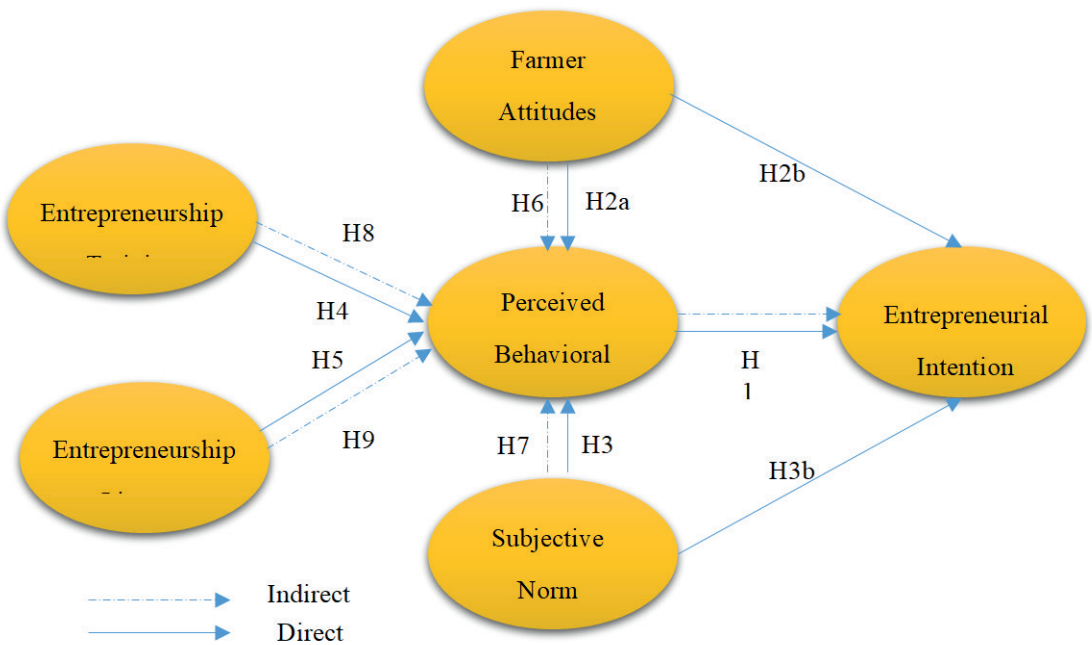

Fig. 2. Proposed framework
Source: Authors' own elaboration

activities from the government, which aim to improve the entrepreneurial literacy of millennial farmers, are expected to strengthen their confidence in facing the challenges of the dynamic agricultural sector, thereby encouraging an increase in entrepreneurial intentions. Therefore, we hypothesize that:

H9: PBC significantly mediates the relationship between entrepreneurial literacy and entrepreneurial intention in millennial farmers.

Materials and Methods

Description of the study area

This research was conducted in Sleman Regency, one of the five administrative regions in the Special Region of Yogyakarta (DIY). Sleman Regency has become the center of attention in agricultural development thanks to its active participation in sustainable agrarian development initiatives launched by the provincial government. In 2022, the Government of Yogyakarta launched a significant program called "One Thousand Millennial Farmers of Yogyakarta", which aims to support the regeneration of the workforce in the agricultural sector. This program is designed to ensure sustainable agricultural development from upstream to downstream in various commodities and has received a positive response from the government.

Of the 1308 millennial farmers spread across Yogyakarta, 40.14% are in Sleman Regency, making it the region with the highest participation. Millennial farmers in Sleman stand out in their activity level, driven by internal and external factors. Internally, the area has a committed and dynamic group of young farmers who are passionate about realizing sustainable farming practices. Externally, young farmers receive strong support from the Sleman Regency Government through various agro-socio-preneurship policies that aim to modernize and advance the agricultural sector.

The role of millennial farmers is critical in fostering agricultural innovation, particularly in adopting modern technologies. According to the Indonesian Ministry of Agriculture Regulation No. 04 of 2019, Article 1, Paragraph 4, millennial farmers are defined as farmers aged 19 to 39 years old, and/or farmers who are adaptive to digital technology Ministry of Agriculture of Indonesia, 2023). This definition highlights the importance of millennial farmers as agents of change in the agricultural sector, especially in mastering modern agricultural technologies that support sustainability and production efficiency.

Based on the above factors, Sleman Regency was chosen as the main focus of this research because its millennial farmers are expected to be the center of excellence in developing young entrepreneurs in the agricultural sector. The region's progressive approach to integrating sustainability and modern farming practices provides an interesting case study of the impact of millennial farmers on agrarian development efforts in the DIY region.

Data and sampling

This study uses a quantitative method with a survey design aimed at millennial farmers who are members of the Millennial Farmers program in Sleman Regency. Out of 1 003 people, the minimum sample size needed is 286 respondents, calculated using the Slovin formula. Sampling was done through a non-probability sampling method with a purposive sampling technique. Respondents were selected based on the following criteria: (1) between the ages of 28 and 43 in 2024, which includes individuals born between 1981 and 1996; (2) domiciled in one of the sub-districts in Sleman Regency; and (3) have a minimum of one year of active membership in the Millennial Farmer program.

Before collecting data thoroughly, a pilot test was carried out on 30 respondents to test the validity and reliability. Once the instrument is valid, the questionnaire is distributed online via private message and offline through face-to-face meetings, depending on the accessibility of respondents. A total of 507 questionnaires were distributed, and 497 questionnaires were declared valid, resulting in a response rate of 98.03%. The data collection took place from June to August 2024, with the support of colleagues from Janabadra University to reduce bias. The study adheres to Janabadra University's research ethics guidelines, where the confidentiality of respondents' data is strictly maintained, and the use of data is limited to academic purposes only.

Measures

All questionnaire items used as data collection instruments in this study are adapted and adjusted to the research context based on previous studies that have been proven valid and reliable. Entrepreneurial intention and attitude are measured using 5 and 4 items adapted from (Zaremohzzabieh et al., 2022). To measure the perception of behavioral control, 5 items were adapted from (Barba-Sánchez et al., 2022). Subjective norms are measured through 3 items adapted from (Kautonen et al., 2015). Subjective norms are measured through 3 items adapted from (Lechuga Sancho et al., 2020) and entrepreneurial literacy using 3 items adapted from (Narmaditya et al., 2023). Each item was evaluated using a 7-point Likert scale, ranging from 1 (strongly disagree) to 7 (strongly agree), to capture a broad spectrum of respondents' perceptions of the constructed being measured. The adaptation of this instrument ensures relevance to the context of agricultural entrepreneurship

among millennial farmers, thus allowing for a comprehensive analysis of the factors influencing their entrepreneurial intentions.

Data analysis

PLS-SEM is used as an analysis technique in this study because of its ability to handle complex structural models (Hair et al., 2019), Especially in the context of agricultural entrepreneurship, where this method has been widely applied to explore factors that affect entrepreneurial intentions (Liang and Chen, 2021; Lv et al., 2024). This method is ideal for predictive research because of its flexibility in handling data that is not normally distributed (Hair et al., 2017). However, as suggested by Hair et al. (2019), data quality checks, including avoiding multicollinearity by checking the VIF value, remain essential to maintaining the validity of the analysis. PLS-SEM also allows the testing of causal relationships between latent variables (Hair et al., 2017), such as attitudes, subjective norms, and perception of behavioral control, which are essential components in the Theory of Planned Behavior (TPB), as well as additional independent variables such as entrepreneurial training and literacy. This study uses a two-step PLS-SEM approach from Hair et al. (2019), which includes measurement models to test reliability and validity and structural models to examine hypothetical relationships between the variables studied.

Finding

Profil of respondent

The results of this survey are based on responses from 497 millennial farmers spread across 17 sub-districts in Sleman Regency, D.I Yogyakarta, Indonesia. A summary of the respondents' profiles can be seen in Table 1. 330 male respondents (66.4%) and 167 women (33.6%) participated in this study. The table also revealed that most farmers were between 34 and 39 years old, namely 261 people (52.5%), while another 215 people (43.26%) were between 28 and 33 years old. Based on the level of education, the most significant percentage is in high school < graduates, as many as 321 people (64.6%), followed by 164 undergraduate graduates (33.0%) and postgraduate graduates, as many as 12 people (2.4%). In addition, this survey also noted that millennial farmers in Sleman have farming experience and have participated in extension activities. Finally, the survey indicated that the five sub-districts with the highest number of respondents were Sleman with 60 respondents (12.1%), Tempel with 48 respondents (9.7%), Mlati and Turi each with 45 respondents (9.1%), Ngaglik with 39 respondents (7.8%), and Minggir with 36 respondents (7.2%).

Table 1. Profil of respondent

Category	Subcategory	Frequency
Gender	Male	330
	Female	167
Age	28~33	215
	34~39	261
	40~41	21
Education Level	≤ High School	321
	Bachelor's degree	164
	Master/Doctoral	12
Farming Experience	1~4 years	330
	5~9 years	115
	10~14 years	27
	> 15 years	25
How Many Times Have You Attended Entrepreneurship Extension Services	1~4 times	428
	5~9 times	45
	10~14 times	21
	>15 times	3
5 Sub-Districts Based on the Highest Number of Respondents	Sleman	60
	Tempel	48
	Mlati dan Turi	45
	Ngaglik	39
	Minggir	36

Source: Primary data processed (2024)

Common method bias test

In behavioral research, questionnaires are often used as the primary instrument for data collection and analysis, making them a widely accepted method among academics. Podsakoff et al. (2003) state that evaluating the variance and potential measurement errors is essential to ensure the results' accuracy. One of the challenges that often arises is general method bias, which can reduce the validity of the data and provide overly optimistic results regarding the relationships between variables. This bias generally occurs when self-reported data measures various constructs, with the same sample answering all questions. To overcome this potential bias, this study conducted a thorough collinearity test through the Variance Inflation Factor (VIF) assessment. Based on the guidelines of Hair et al. (2019), a VIF value below 3.3 indicates the absence of general method bias. The results of the VIF test in Table 2 show that all constructs have values below that threshold, so it can be concluded that there is no indication of bias of the general method in this study. Thus, the data collected is considered valid and reliable for further analysis.

Measurement model testing (outer model)

The data analysis in this study uses the Partial Least Squares Structural Equation Modeling (PLS-SEM) approach, which consists of two main stages. The first stage involves testing the measurement model to assess the validity and reliability of the construct. At this stage, the validity of the discrimination, the validity of convergence, and the reliability of the composite are comprehensively tested (Hair et al., 2017). Based on the results presented in Table 2, the composite reliability (CR) values ranged from 0.845 to 0.926, which indicates excellent internal consistency as all of them exceeded the recommended minimum threshold of 0.70 (Hair et al., 2019).

The validity of convergence was measured using factor loadings and Average Variance Extracted (AVE). Referring to the guidelines of (Hair et al., 2019), factor loadings with values above 0.70 and AVE above 0.50 are considered adequate. However, in this study, ATB2, EI3, EI4, PBC1, and PBC5 should be removed because they have an outer loading value below 0.70, which does not meet the recommended minimum limit. After removing these items, the loading factor ranges from 0.741 to 0.889, which is entirely above the recommended minimum limit, so the convergence validity can be said to be met. In addition, the AVE value ranges from 0.646 to 0.733, indicating adequacy as it is above the minimum threshold of 0.50. The validity of discrimination is tested using the Fornell-Larcker ratio, as listed in Table 3. The results show that all values meet the Fornell-Larcker criteria, which ensures that there are no discrimination validity problems where the validity value of the construct is higher than the correlation between variables (Fornell and Larcker, 1981). Overall, the testing of this measurement model confirms that the instrument used

Table 2. Results of convergent validity, composite reality, and VIF tests

Construct	Item	Loading	CR	AVE	VIF
Entrepreneurial Intention (EI)	EI1	0.822	0.879	0.708	1.643
	EI2	0.871			1.867
	EI5	0.831			1.618
Entrepreneurship Literacy (EL)	EL1	0.883	0.892	0.733	1.842
	EL2	0.876			2.000
	EL3	0.807			1.721
Entrepreneurship Training (ET)	ET1	0.869	0.926	0.715	3.067
	ET2	0.882			3.232
	ET3	0.880			2.910
	ET4	0.791			1.771
	ET5	0.802			2.134
Farmer Attitudes (FA)	FA1	0.744	0.845	0.646	1.360
	FA3	0.771			1.460
	FA4	0.889			1.762
Perceived Behavioral Control (PBC)	PBC2	0.852	0.850	0.655	1.624
	PBC3	0.741			1.402
	PBC4	0.830			1.450
Subjective Norm (SN)	SN1	0.763	0.846	0.647	1.396
	SN2	0.803			1.394
	SN3	0.844			1.584

Source: Primary data processed (2024)

Table 3. Results of the discrimination validity test (Fornell-Larcker ratio)

	EI	EL	ET	FA	PBC	SN
EI	0.842					
EL	0.391	0.856				
ET	0.69	0.408	0.846			
FA	0.767	0.438	0.661	0.804		
PBC	0.773	0.456	0.678	0.747	0.809	
SN	0.575	0.419	0.585	0.603	0.644	0.804

Source: Primary data processed (2024)

is valid and reliable, making it feasible to be used in the next stage of structural analysis.

Test results of the PLS structural model

Table 4 shows the results of the structural model analysis obtained through SmartPLS 4. Before testing the hypothesis, the determination coefficient (R^2), predictive relevance (Q^2), and Standardized Root Mean Square Residual (SRMR) values were calculated. Through the blindfolding technique with cross-validated redundancy, the Q^2 values for PBC and entrepreneurial intent were 0.417 and 0.474, respectively, exceeding the threshold of 0.25, indicating moderate predictive relevance (Hair et al., 2019). The R^2 value revealed that training, literacy, positive attitudes, and subjective norms contributed 65.5% to the change in PBC among millennial farmers. In addition, a combination of training, literacy, positive attitudes, subjective norms, and PBC explains 68.0% of millennial farmers' entrepreneurial intentions. R^2 values exceeding 0.50 indicate a moderate influence (Hair et al., 2019). The SRMR value of the estimated model is 0.072, which is still within the accepted threshold of 0.085, indicating a suitable model suitability (Henseler et al., 2014). A bootstrapping procedure with 5 000 samples validated the statistical significance, resulting in standard errors and significant t-values (Hair et al., 2017).

Table 4. R^2, Q^2, and SRMR test results

Construct	R^2	Q^2	SRMR
EI	0.680	0.474	0,072
PBC	0.655	0.417	

Source: Primary data processed (2024)

Hypothesis test

The statistical significance (p = 0.05) of the relationship path coefficient is described in Table 5 and Figure 3. Based on Table 5, it was found that perceived behavioral control (PBC) on entrepreneurialintention had a path coefficient of b = 0.431. Positive attitudes towards PBC and entrepreneurial intention showed the path coefficients of b = 0.425 and b = 0.417, respectively. Meanwhile, the subjective norm for PBC has a pathway coefficient of b = 0.214, while for entrepreneurial intention, it is only b = 0.046, which shows statistical

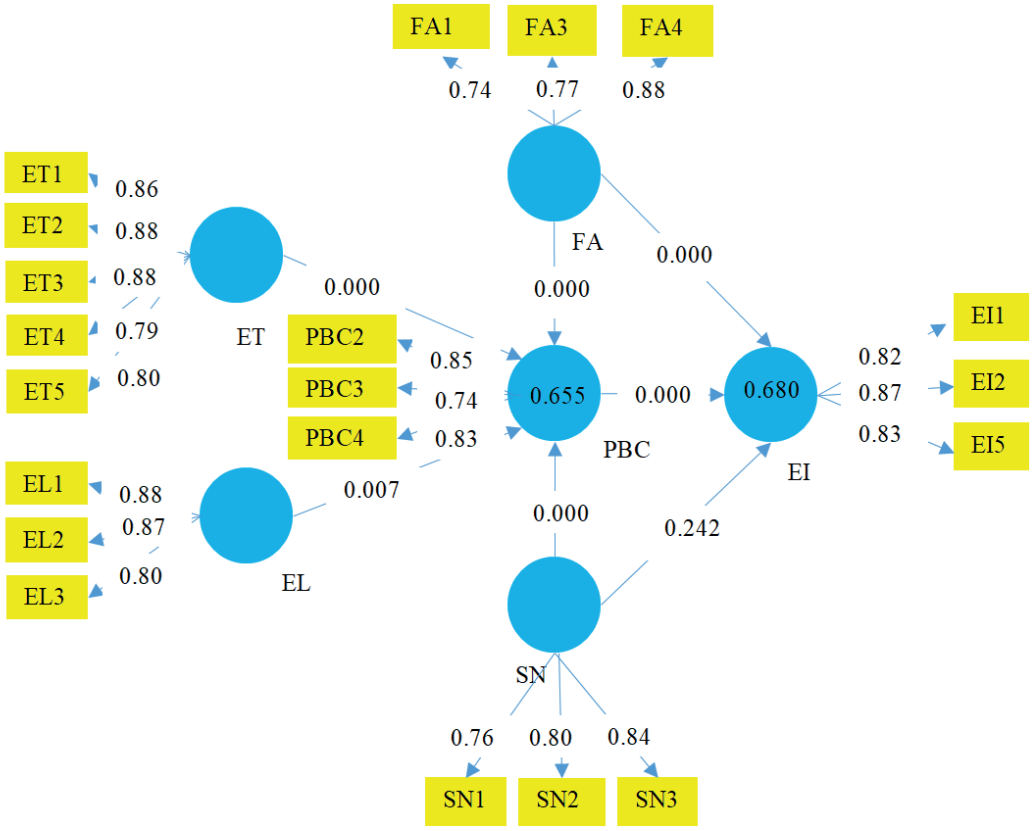

Fig. 3. Bootstrapping results

Source: Primary data processed (2024)

insignificance in the relationship between subjective norms and entrepreneurial intention. Therefore, the hypothesis H1, H2(a,b)–H3(a) is accepted, except for H3b. In addition, the relationship between entrepreneurship training and PBC and entrepreneurial literacy with PBC is statistically significant with pathway coefficients of b = 0.238 and b = 0.084, respectively, thus supporting the H4 and H5 hypotheses.

The analysis was carried out using the bootstrapping method on SmartPLS 4 to test the mediation effect, as recommended by Hair et al. (2017). This method does not require assumptions regarding variable distributions or sample distributions from statistics. The test results in Table 5 show that PBC partially mediates the relationship between positive attitudes and entrepreneurial intentions, which supports the H6 sub-hypothesis. In addition, PBC fully mediates the relationship between subjective norms, training, entrepreneurial literacy, and entrepreneurial intentions, which supports the H7 to H9 hypothesis. According to Nitzl et al. (2016), Partial (complementary) mediation occurs when the direct and indirect effects are significant and point in the same direction. In contrast, complete mediation happens when the mediation variable thoroughly explains the relationship between the independent variable (X) and the dependent variable (Y) so that the direct relationship between X and Y is no longer significant after the mediation variable is included in the model.

Discussion

The results of hypothesis testing show that PBC has a significant role in increasing entrepreneurial intentions among millennial farmers by the H1 hypothesis. The path coefficient of 0.431 indicates that the higher the behavioral control felt, the greater the intention to become an entrepreneur. This is in line with previous findings, such as Ezeh (2023), Suwanan and Allya (2023), Mubarak et al. (2022), Karimi et al. (2017), Gunasinghe and Sachitra (2022), Che Nawi et al. (2022), and Tambwe and Mapunda (2024), which stated that PBC is one of the strong predictors of entrepreneurial behavior, especially in the context of sectors, faced with many uncertainties such as agriculture. According to (Ajzen, 1991), PBC is considered one of the most potent determinants in predicting one's intention to act, especially when individuals feel uncertain about future outcomes or challenges. In the context of agriculture, millennial farmers are often faced with high uncertainty, such as price volatility (Assouto et al., 2020; Singhal and Tarp, 2024), Climate change (Bailey et al., 2022), and access to technology (especially for the older generation) (Novisma and Iskandar, 2023; Widiyanti et al., 2023), Third, it affects the perception of millennial farmers about their ability to control the results of entrepreneurial activities.

Referring to the discussion above, it can be concluded that PBC is a very relevant predictor in the context of entrepreneurship, especially in risky sectors (Brännback et al., 2018; Karimi et al., 2017). PBC not only plays a role in shaping entrepreneurial intentions but also relates to individual perceptions of millennial farmers' ability to face uncertainty and risk (Astuti et al., 2023; Tadi et al., 2024). Thus, in the case of millennial farmers, confidence in managing modern agribusiness businesses is a crucial factor that increases PBC (Riptanti et al., 2024; Romadi et al., 2023). This has implications for an increase in the intention to be entrepreneurial, where farmers who have a positive perception of control and ability, millennial farmers, tend to be more optimistic and

Table 5. Results of the path hypothesis test

	Path coefficient (β)	STDEV	T values	P values	Support (Yes/No)
Direct relationship					
PBC -> EI	0.431	0.055	7.781	0.000	Yes
FA -> PBC	0.425	0.057	7.442	0.000	Yes
FA -> EI	0.417	0.056	7.401	0.000	Yes
SN -> PBC	0.214	0.048	4.444	0.000	Yes
SN -> EI	0.046	0.040	1.169	0.242	No
ET -> PBC	0.238	0.050	4.707	0.000	Yes
EL -> PBC	0.084	0.031	2.685	0.007	Yes
Indirect relationship					
FA -> PBC -> EI	0.183	0.034	5.431	0.000	Yes
SN -> PBC -> EI	0.092	0.024	3.894	0.000	Yes
ET -> PBC -> EI	0.102	0.028	3.667	0.000	Yes
EL -> PBC -> EI	0.036	0.014	2.535	0.011	Yes

Source: Primary data processed (2024)

brave in taking risks to start and develop agribusiness businesses.

Positive attitudes towards entrepreneurship were also directly related to PBC and entrepreneurial intention, with path coefficients of 0.425 and 0.417, respectively, supporting the H2(a) and H2(b) hypotheses. These findings confirm the critical role of attitude in influencing entrepreneurial intentions, where positive attitudes not only increase confidence in controlling the entrepreneurial process (PBC), but also strengthen the intention to start and develop a business. This link between attitudes and intentions is particularly relevant in the context of modern agriculture, which today faces a variety of challenges, such as accessing the latest technologies (Mahattanakhun and Suvittawat, 2023), Land limitations (Lei et al., 2023), Price fluctuations (Khatri et al., 2023), and climate change (Bailey et al., 2022). An optimistic and open attitude towards innovation in agribusiness entrepreneurship is essential for millennial farmers to respond to these challenges. A positive attitude allows millennial farmers to respond to these challenges. In fact, with a positive attitude, millennial farmers can be more open in accepting the opportunities and risks that exist, as well as being more proactive in utilizing technology and opening access to a broader market (Novisma and Iskandar, 2023).

Furthermore, previous literature has affirmed that attitude is critical in shaping entrepreneurial intentions and making agriculture a promising career opportunity (Roy, 2023; Zaremohzzabieh et al., 2022). In fact, in the modern agricultural sector, innovation and entrepreneurship are no longer an option but a necessity (Martinho, 2020). Millennial farmers with a positive attitude towards entrepreneurship tend to be more motivated to innovate, adopt technology, and create solutions to agrarian problems (Nosma and Iskandar, 2023). Thus, it is essential to always prioritize a positive attitude when reading about business opportunities, especially in the agricultural sector. So, this ability can give rise to entrepreneurial intentions in agribusiness as one of the ways to develop the farming industry.

The difference is in the subjective norm, which only significantly influences PBC with a path coefficient of 0.214. However, it does not substantially affect entrepreneurial intention (path coefficient = 0.046). This finding is not in line with previous research such as Lv et al. (2024), Chin et al. (2024), and as a reference in formulating the hypothesis of this study that subjective norms simultaneously affect PBC and intention. In other words, these findings suggest that social influences, such as expectations from family, friends, or the surrounding community, are not strong enough to directly encourage entrepreneurial intent (Chin et al., 2024). On the contrary, subjective norms play a more significant role in shaping the perception of controlling millennial farmers' behavior, as Astuti et al. (2023) revealed. This indicates that the social pressures faced by millennial farmers are irrelevant in motivating entrepreneurial intentions, which are more likely to be influenced by personal factors such as confidence and knowledge of entrepreneurship.

These findings align with previous literature stating that while important, subjective norms are not always a direct predictor of entrepreneurial intention (Alexander and Honig, 2018; Marbaniang and Rajput, 2023). In the context of millennial farmers, social norms tend to influence millennial farmers' perceptions of the ability to control external factors in running a business, such as perceptions of the social support that farmers may get. However, this does not necessarily shape the intention of millennial farmers to become entrepreneurs. On the other hand, entrepreneurial intentions are more influenced by intrinsic factors, such as belief in one's abilities and understanding of the entrepreneurial process (Esfandiar et al., 2019; Ghouse et al., 2024). It also shows that several contextual factors can weakly influence subjective norms on entrepreneurial intentions. One is the social pressure millennial farmers face (Hadi Kurniyawan et al., 2024), often oriented towards job security and income stability rather than the risks inherent in entrepreneurship.

Moreover, social expectations from the immediate environment may not encourage millennial farmers to innovate or entrepreneurship because entrepreneurship in the agricultural sector is often perceived as a high-risk and unstable business. This is in line with findings that show that the traditional farming sector is usually seen as less attractive to younger generations, who are more interested in more established and high-tech jobs (Consentino et al., 2023; Janaćković and Dimitrijević, 2024). Thus, social pressure or subjective norms will be more productive if combined with increased individual capacity.

Regarding entrepreneurship training and literacy, it shows that entrepreneurship training has a pathway coefficient of 0.238, while entrepreneurship literacy has a pathway coefficient of 0.084, significantly affecting PBC. These findings reinforce the argument that capacity building through entrepreneurship training and literacy can encourage millennial farmers to feel more confident and have greater control over their businesses, ultimately increasing their intention to be entrepreneurial.

As confirmed in these results, entrepreneurship training has a more substantial influence than entrepreneurial literacy on PBC. This can be explained through training mechanisms that provide not only knowledge but also practical skills, simulations, and hands-on experience relevant to the real challenges of running agribusiness. The training helps

millennial farmers understand how to deal with risks such as price volatility, climate change, and market uncertainty and provides them with a tool to manage their businesses more effectively (García-Machado et al., 2024; Rashid et al., 2024). This effect then increases the perception of millennial farmers about the control that farmers have over various aspects of their business. This is also what strengthens PBC, which ultimately has an impact on entrepreneurial intentions.

The same is true of entrepreneurial literacy; although it has a minor influence on training, it still significantly improves PBC. Entrepreneurial literacy refers to in-depth knowledge and understanding of entrepreneurial concepts and processes, including financial management, market access, and technology (Hammer and Siegfried, 2023; Rashid et al., 2024). Millennial farmers with good entrepreneurial literacy will have a more comprehensive view of the opportunities and risks faced (Kojo Oseifuah, 2010), especially in running agribusiness businesses. This helps millennial farmers plan more mature business strategies and manage resources more efficiently, ultimately increasing their perception of control over the company.

Based on the above findings, we argue that the combination of entrepreneurship training and literacy has a synergistic impact on PBC. Millennial farmers who receive direct training can apply the knowledge gained from entrepreneurial literacy in a practical context. In other words, training provides the technical skills needed to leverage the entrepreneurial knowledge that millennial farmers already have, thereby strengthening millennial farmers' control over business decisions. This is particularly relevant in modern agriculture, where innovating and utilizing new technologies is crucial in facing global challenges such as climate change and market dynamics. This discovery supports previous literature, such as Bohlayer and Gielnik (2023), Chalayonnavin (2024), Puni et al. (2018), and Hu et al. (2021), which emphasizes the importance of education and training interventions in encouraging PBC in entrepreneurship. Transforming traditional farmers into entrepreneurial farmers requires systematic capacity building through entrepreneurship training programs and literacy improvement in more complex agriculture.

The following discussion shows that PBC is a significant mediator in the relationship between attitudes, subjective norms, entrepreneurship training, entrepreneurial literacy, and entrepreneurial intention among millennials. The results of this mediation test support the H6 to H9 hypothesis, which shows that PBC functions as a critical mechanism that connects internal and external factors with entrepreneurial intentions. The effect of this mediation also provides in-depth insight into how PBC can strengthen entrepreneurial intentions by increasing the perception of individual control over the businesses that millennial farmers undertake.

This research aligns with the TPB framework initiated by (Ajzen, 1991), which places PBC as one of the main determinants in forming intentions. However, these results also expand on previous findings by showing that PBC is not only influenced by subjective attitudes and norms but also by external factors such as entrepreneurship training and literacy. Entrepreneurship training that emphasizes technical skills and risk management affects the success of millennial farmers' agribusiness businesses. In addition, entrepreneurial literacy also plays an essential role in strengthening millennial farmers' confidence in their ability to run a business, thereby increasing their Intention to be entrepreneurial. In the subsequent analysis, the mediation role of PBC shows that millennial farmers with a positive attitude towards entrepreneurship, receive relevant training, and have high entrepreneurial literacy have a stronger PBC, which ultimately encourages entrepreneurial intentions.

It is also relevant in modern agribusiness, where price fluctuations, climate change, and technological access require greater individual control over external factors. By improving PBC through interventions such as training or entrepreneurship development programs, millennial farmers will feel better able to manage the uncertainties and risks associated with agribusiness. In addition, the findings of this study also underline the role of subjective norms in shaping PBC, even though subjective norms do not directly affect entrepreneurial intentions.

The implications of these findings are evident in practical terms. Entrepreneurship development programs in the agricultural sector should prioritize interventions that can improve PBC, such as training that focuses on strengthening technical skills, risk management, and entrepreneurial literacy. The increase in PBC will give millennial farmers more control over an uncertain business environment. In addition, the programs should integrate elements of social support to reinforce subjective norms, which, although they do not directly affect intentions, can support the improvement of PBC.

The findings of this study provide a solid basis for developing policies focused on increasing the capacity of farmers, especially millennial farmers, through strategic programs. First, the government can actively provide entrepreneurship training that focuses on developing agribusiness technical skills through relevant ministries such as the Ministry of Agriculture and the Ministry of Cooperatives and SMEs. In this case, it is not only theoretical but technology-based training that focuses on precision agriculture, big data, and internet-based applications for supply chain management that can provide a competitive advantage for millennial farmers.

Second, the government can work with the private sector and NGOs to deliver programs that enrich farmers' knowledge of financial management, market access, and product diversification. This literacy must be implemented through a community-based approach, which focuses on increasing knowledge individually and developing the social capital of millennial farmers.

Third, the government can incentivize agrotech companies to partner with millennial farmers, providing access to technologies such as soil sensors, automatic irrigation, and digital platforms for marketing. In addition, it presents several environments that support innovation, such as an extensive internet network in rural areas and the development of agribusiness innovation centers in remote areas of Indonesia.

Fourth, providing easier access to business capital, microcredit, market development support, and agricultural insurance protects farmers from the risk of crop failure due to extreme weather.

Fifth, collaboration with mass media and digital platforms in conducting public campaigns that aim to change the view of a handful of people, especially the younger generation, that agriculture can be an attractive sector by adopting agribusiness technology and innovation.

Conclusions

Practical and theoretical contribution

This study makes a theoretical contribution to understanding entrepreneurial intentions among millennial farmers in Indonesia's agricultural sector by expanding the Theory of Planned Behavior/TPB. In particular, integrating entrepreneurial literacy and entrepreneurship training increases the predictive power of Perceived Behavioral Control (PBC) on entrepreneurial intentions, which is new in agribusiness. The findings show that PBC is a significant mediator, linking attitudes, subjective norms, and external efforts such as entrepreneurship education to engage in agribusiness ventures. Entrepreneurship training significantly affects PBC more than entrepreneurial literacy, indicating the importance of practical skills-based programs rather than theoretical knowledge alone.

From a practical perspective, this study provides insight into developing more effective entrepreneurship programs in agriculture for the younger generation. This includes focused entrepreneurship training, more appropriate policy-making to support agribusiness, and marketing strategies that appeal to millennials. The study also provides a platform for government agencies and agricultural extension to improve their approaches, especially regarding technology integration, risk management, and better market access to empower millennial farmers.

Limitations and future research

Although it makes a significant contribution, this research has some limitations. First, the measurement of entrepreneurial literacy can still be expanded by including practical elements related to business management and market strategy in more detail. This opens up opportunities for future research to refine the measuring instrument and increase the depth of analysis. Second, the insignificance of subjective norms on entrepreneurial Intention suggests that intentional pressure may have less effect than behavioral control or personal skills. Further research can further explore the role of social and cultural support systems, especially in the context of geographical and social diversity in Indonesia.

In addition, this research is limited to the Yogyakarta area and millennial farmers in Indonesia. For future research, expanding the region's scope or conducting cross-cultural comparisons is recommended to see the differences in the relationship between entrepreneurial Intention, PBC, and intention factors such as training and literacy. Examining the long-term impact of these interventions on business performance and agribusiness sustainability can also provide deeper insights for policy and program development.

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