Farmers' entrepreneurial behavior in long pepper (*Piper retrofractum* Vahl) cultivation in Bluto District, Sumenep Regency

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Abstract. The cultivation of long pepper presents promising economic and agroclimatic potential. Sumenep Regency—characterized by its suitability for long pepper cultivation—remains underutilized due to limited intensive management by local farmers. This phenomenon hinges significantly on farmers' entrepreneurial behavior. This study seeks to evaluate and understand the entrepreneurial behavior of long pepper farmers in Sumenep Regency and identify the factors that influence this behavior using six indicators as follows future orientation, risk-taking propensity, task and result orientation, confidence, innovation and persistence. Primary data was gathered through questionnaires administered to a sample of 50 farmers selected using purposive sampling, ensuring that respondents were selected based on their relevance to the research objectives. Descriptive statistics and multiple linear regression were employed for data analysis. The descriptive findings indicate that most farmers exhibit satisfactory entrepreneurial behavior across four defining indicators: future orientation, risk-taking propensity, task and results orientation, and innovation. Moreover, farmers demonstrate commendable entrepreneurial traits in terms of self-efficacy and persistence. Regression analysis reveals that farmers' experience and membership in agricultural groups positively correlate with entrepreneurial behavior, whereas educational attainment shows no significant impact. These findings could inform targeted interventions to improve entrepreneurial behavior among farmers and potentially improve cultivation and economic sustainability.

1 Introduction

The cultivation of long pepper shows promising economic prospects. The demand for long pepper as an industrial raw material is anticipated to increase alongside the growth of the traditional and modern medicine industries, which are trending towards "*back to nature*" approaches (Arifiyanti *et al*., 2009). Additionally, the international market demand for long pepper remains substantial. In 2019, Indonesia supplied one-third of the global market's needs. Beyond the promising market demand, the price of long pepper is relatively high and exhibits less fluctuation than cayenne pepper. In 2021, the price of dried long pepper ranged from IDR 48,000 to IDR 99,000 per kilogram (Hasan & Ihsannudin, 2022a). Madura is an ideal location for long pepper cultivation due to its favorable agroclimatic conditions. The region's temperature and soil conditions are optimal for the growth of long peppers (Ferdiansyah *et al*., 2009). The economic and agroclimatic potential of long pepper cultivation in Madura, particularly in Sumenep Regency, remains largely underutilized by local farmers. This is evidenced by the modest growth in land area and production. In 2019, Sumenep Regency had 2,576.94 hectares dedicated to long pepper cultivation, yielding 9,043.49 tons. In 2020, while the land area increased by 13.8% to 2,587.53 hectares, production only saw a slight rise of 0.4% to 10,299.67 tons. The increasing in land area, and production of long pepper show that in the future the this commodity has great potential to be developed. Research by Anisah & Hayati (2017) also indicates that many farmers (50.01%) are reluctant to continue intensive long-pepper cultivation.

In addition to its economic potential and agroclimatic suitability, several other factors significantly contribute to the success of farming. Research by Rusadi *et al*. (2015) provides empirical evidence that farmers' entrepreneurial behavior plays a crucial role in determining their farming success.. Similarly, the research by Lans *et al*. (2017) indicate that agricultural entrepreneurship strongly influences business growth and sustainability, particularly amidst dynamic economic and business landscapes, necessitating robust entrepreneurial skills among farmers (Mukti *et al*., 2018). However, Hasan & Ihsannudin (2022b) highlight that some long pepper farmers exhibit inadequate entrepreneurial behavior. The entrepreneurial behavior is interpreted as the ability that exists in a farmer to be entrepreneurial by

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conducting the business of long pepper. For instance, farmers often prioritize pepper cultivation only when prices are high, neglecting efforts to add higher value to their produce. Despite this, certain farmer groups have found profitability even at the lowest long pepper prices. Hasan & Ihsannudin (2022b) have focused exclusively on one aspect of entrepreneurial behavior within the long pepper farming sector in Sumenep Regency. Benjamin (2018) identifies several key indicators of entrepreneurial behavior, including future orientation, risk-taking propensity, task and results orientation, confidence, innovation, and persistence/hard work.

Therefore, a more comprehensive investigation is warranted to explore these various dimensions of entrepreneurial behavior among farmers. In contrast, previous studies such as those conducted by Rusadi *et al*. (2015), Khairiyakh *et al*. (2019), and Purnama *et al*. (2022) have predominantly examined the impact of entrepreneurial behavior on farming success or performance. Research examining the determinants of farmers' entrepreneurial behavior remains limited despite its crucial importance. Understanding these factors is fundamental for initiating improvements in farmers' entrepreneurial behavior. Such enhancements can yield benefits not only at the micro level (enhancing farming success) but also at the macro level (potentially influencing investment success rates) that accelerate agricultural sector development and economic growth (Saghaian *et al*., 2022). Against this backdrop, this study aims to investigate the entrepreneurial behavior characteristics of long pepper farmers and identify the factors influencing entrepreneurial behavior among farmers in Sumenep Regency.

2 Research method

Madura has great potential in the production of long pepper, and the largest production of long pepper comes from Sumenep Regency. Sumenep Regency accounts for 51% (10,299.67 tons) of the total long pepper production in Madura, with Bluto District emerging as the leading producer at 26.8% among other districts in Sumenep Regency (Indonesia's Central Bureau of Statistics, 2021). In addition having a larger producers of long pepper than other sub-districts, farmers in Bluto incorporated into farmer groups whose members are active. Based on that data, the research was conducted in Bluto District, Sumenep Regency. This study targeted long pepper farmers in Bluto District, although the exact population size was not definitively known. Sampling was conducted across multiple selected villages. The sample size was determined using the formula adapted from Lemeshow *et al*. (1990 in Hasan [2020]). The formula is expressed as follows:

$$n = p(1-p)\left(\frac{Z_{\propto}}{e}\right)^2 \quad (1)$$
$$n = 0.5(1-0.5)\left(\frac{1.960}{0.15}\right)^2$$
$$n = 0.5(0.5)(13.06)^2 = 42.68 = 43$$

The sample size, denoted as *n*, was determined using the Lemeshow method, where *Z* represents the standard score on the normal curve corresponding to a 95% confidence level (1.960). In the formula, *p* denotes the anticipated proportion of the population, and given the unknown population size, *p* and *q* were assumed to be 0.5 each. The margin of error, *e*, was set at 15%. Applying these parameters, the Lemeshow formula yielded a minimum required sample size of 43 respondents. This study opted to utilize a sample size of 50 respondents. The employed sampling technique was purposive sampling, ensuring that respondents were selected based on their relevance to the research objectives.

Primary data in this study were gathered from respondents through structured interviews based on questionnaire guidelines. The questionnaire was designed to assess entrepreneurial behavior indicators adapted from Benjamin (2018), which include as follows:

1. Future orientation,
2. Risk-taking propensity,
3. Task and results orientation,
4. Confidence,
5. Innovation, and
6. Persistence/hard work.

Responses were measured on an ordinal Likert scale ranging from 1 to 5 (1 = strongly disagree; 2 = disagree; 3 = neutral; 4 = agree; 5 = strongly agree).

Descriptive statistics were employed to analyze the data, serving the primary research objective. This analysis was chosen to help summarize the data and make it easier to understand about the entrepreneurial behavior indicators. The total scores obtained from respondents were calculated and categorized using thresholds adapted from Widhiarso (2015 in Hasan [2020]) as follows:

$$\begin{gathered} Low\ (poor) = X < (\mu - 1.\sigma) \\ Medium\ (moderate) = (\mu - 1.\sigma) \leq X\ (\mu + 1.\sigma) \\ High\ (good) = X > (\mu + 1.\sigma) \end{gathered} \quad (2)$$

Here, *X* represents the total score achieved by each respondent, μ denotes the mean score calculated from the hypothetical drift, and σ represents the hypothetical standard deviation. These statistical parameters were derived using the formulas below:

$$\sigma = \frac{1}{6}(total\ max\ score - total\ min\ score) \quad (3)$$

The second research objective was accomplished through the application of multiple linear regression analysis to trace the pattern of relationships between independent variables and dependent variable. The selection of independent variables was informed by prior studies, specifically group membership (Mulia & Suarda, 2019), education level (Umar *et al*., 2019), and farming experience (Karabulut, 2016). The mathematical equation for multiple regression is expressed as follows:

$$Y = a + b_1X_1 + b_2X_2 + b_3D \quad (4)$$

Here, Y represents entrepreneurial behavior assessed on a Likert scale, X_1 denotes education level in years, X_2 signifies farming experience in years, and D is a dummy variable for group membership (1 = member; 0 = non-member). Hypothesis testing was conducted using a *t*-test, with a significance level (α) set at 5 %.

3 Results and discussion

3.1 Respondents' entrepreneurial behavior

Based on the score categorization adapted from Widhiarso (2015) as described in Hasan, (2020), the distribution of respondents' entrepreneurial behavior across each indicator is detailed in Table 1. A significant majority (86%) of respondents fall into the medium category for future orientation. As we know that the business is dynamic and will undergo changes in the future. So, the future orientation shows that the farmers' entrepreneurial attitude that is always curious makes about something new so that their ability to do cultivation of long pepper will always increase. This indicator also was assessed using questions related to business development planning, information-seeking for business improvement, and satisfaction with crop yields. Many farmers indicated no plans to expand their long pepper cultivation or increase plant numbers, citing constraints such as limited land and capital. This strategic decision aligns with their prioritization of meeting their families' food needs, supported by findings from Hasan & Ihsannudin (2023) indicating that a majority (64%) of long pepper farmers in Madura cultivate long pepper as a hedge crop while cultivating staple crops like corn, beans, and rice during the rainy season for household consumption. Additionally, some farmers allocate land for cultivating grass as animal feed.

Table 1. Distribution of respondents based on indicators of entrepreneurial behavior.

Indicators	Categories		
	Poor (percentage)	Moderate (percentage)	Good (percentage)
Future orientation	1 (2%)	43 (86%)	6 (12%)
Risk-taking propensity	13 (24%)	24 (48%)	13 (26%)
Task and results orientation	4 (8%)	38 (76%)	8 (16%)
Confidence	0 (0%)	2 (4%)	48 (96%)
Innovation	28 (56%)	19 (38%)	3 (6%)
Persistence/hard work	2 (4%)	14 (28%)	34 (68%)

Statements related to seeking information for business improvement, such as taxonomic information, innovation, and market trends, are not actively pursued by many farmers. Instead, they tend to rely passively on information from a small number of fellow farmers, group leaders, and agricultural extension officers. Furthermore, despite these passive information-seeking behaviors, most farmers express satisfaction with current crop yields. However, it is notable that the average production of dried long pepper in Sumenep Regency is only approximately 875 kg/ha/year (Department of Agriculture, Food Crops, Horticulture, and Plantations, 2019), significantly below the potential production target of around 2.5 tons/ha/year (Djauharia & Rosman, 2009). This sense of satisfaction may contribute to limited efforts to enhance production, such as inadequate attention to fertilizer type and dosage. According to Ruhnayat *et al*. (2011), applying organic manure at a rate of 5 kg/hectare/year, along with urea fertilizer + SP-36 + KCl (1:2:2) at 75 g/hectare/year or using 15 kg/hectare/year of manure combined with urea fertilizer + SP-36 + KCl (2:1:2) at 50 g/hectare/year, enhances the growth of productive five-year-old long pepper plants in Sumenep Regency.

Table 1 reveals that the risk-taking propensity indicator has the second-lowest distribution among respondents, at 24%, following innovation at 56%. This indicator is assessed through three statements: willingness to borrow capital, willingness to defer sales, and willingness to finance irrigation during the rainy season. According to Sethi *et al*. (2013), the willingness to borrow capital reflects a farmer's readiness to undertake financial risks. A significant majority—68% of respondents—expressed reluctance to borrow capital or seek credit when their farming capital was insufficient. Instead, they prefer to operate their farms with existing capital. This reluctance stems from perceived complexities in accessing formal credit and concerns about usury (*riba*) associated with non-formal credit sources. Additionally, there is apprehension about the possibility of farming failure, which could hinder their ability to repay borrowed funds.

Only 18% of farmers are willing to delay selling their long pepper when prices are perceived to be below expectations; the majority opt to sell once they have harvested enough dried long pepper. This indicates that a mere 18% of respondents are willing to take future price risks. The lack of financial reserves to meet family needs compels them to sell their long peppers even when prices are less than anticipated. This situation aligns closely with findings from Bappebti (2011), which highlight that while rice farmers can potentially avoid low prices by postponing sales, they simultaneously face urgent cash requirements.

Table 1 illustrates the distribution of respondents based on task orientation indicators, revealing that 8% are categorized as poor and the majority, 76%, as satisfactory. This indicates that 84% of respondents do not adhere to good agricultural practices (GAP), such as using quality seeds, regular crop care, proper fertilization (considering type, amount, and timing), and irrigation during dry seasons. A significant 82% of

respondents admitted to not using quality seeds, which correlates with findings from Hasan & Ihsannudin (2022b) indicating that nearly all farmers in Sumenep Regency rely on seeds from their crops or uncertified vendors. The reluctance to use superior seeds is primarily attributed to high costs and limited availability. Ulma (2017) emphasizes the importance of superior seeds for their potential to enhance crop quality and productivity.

Long pepper is a plant that does not tolerate waterlogging but requires consistent watering, especially during the dry season. Despite this, 44% of respondents do not water their plants during dry periods, risking wilting or even plant death. The primary reason for this is the difficulty in accessing water sources in the Bluto District. Available water is often from deep wells or locations far from the long pepper fields, necessitating considerable effort and expense to transport water.

Table 1 shows that the majority of respondents (96%) exhibit high confidence. According to Shaheen & Al-Haddad (2018), high self-efficay is often reinforced by high self-efficacy, which can be demonstrated by extensive experience. Farmers in Bluto District have substantial experience in cultivating long pepper—a practice that has been established in Madura since ancient times (Sudarmaji *et al*., 2019). The respondents reported experience ranging from 10 to 40 years.

Table 1 also shows that 56% of respondents (farmers) have poor innovation abilities in cultivation, product processing, and marketing techniques. Innovation is a crucial quality for farmer-entrepreneurs, especially in competitive or rapidly changing environments (Kahan, 2012). According to Sullivan (2017), successful agricultural entrepreneurs must actively engage in farming, utilize current technologies (to boost productivity), and adopt new operating systems.

Despite the overall poor rating, some long pepper farmers in Bluto District demonstrate significant innovation. For example, they employ advanced irrigation methods, such as using reservoirs and hose systems, ensuring continuous water availability and reducing waste. Another form of innovation involves processing long pepper into derivative products rather than selling it solely in its dried form. Some farmers have creatively incorporated long pepper into coffee mixtures, thus adding value and diversifying their product offerings.

In addition, Table 1 indicates that the majority of respondents (68%) exhibit persistent behavior in cultivating long pepper. Farmers continue to care for their long pepper plants even when prices drop and during the dry season, though the intensity of care varies among them. Importantly, no farmers were found who planned to cut down or destroy their long pepper plants despite these challenges.

3.2 The influence of education, experience, and farmer group membership on entrepreneurial behavior

The variables of education, experience, and group membership explain 36.2% of the variation in farmers' entrepreneurial behavior (adjusted *R*-squared), as shown in Table 2. Other factors likely influencing entrepreneurial behavior include access to information and resources (Mair, 2002), access to credit (Asmoro *et al*., 2022; Kisaka, 2014), family and government support (Marliati, 2020), environmental factors (Akter & Iqbal, 2022), and financial support (Dharmanegara *et al*., 2022).

Table 2. Multiple linear regression analysis results.

Variables	Coefficient	*t*-Significance
Education	0.388	0.105
Farming experience (*self-efficacy*)	0.252	0.005
Farmer group membership	4.374	0.007
Constant	57.505	
Adjusted *R*-squared	0.362	
F-sig.	0.000	

Note: independent variable = entrepreneurial behavior.

Table 2 shows that the level of education has no significant effect on farmers' entrepreneurial behavior. This contradicts the assertion that education is a crucial factor in determining the intention to start a business (Brownson, 2014). However, the findings align with research by Shaheen *et al*. (2023) and Sancho *et al*. (2022), which also found that education level does not significantly impact entrepreneurial behavior. This does not imply that education is unimportant in entrepreneurship development. Instead, it suggests that education level should not be the primary criterion for selecting participants in entrepreneurship development programs.

In this study, the education variable refers to the level of formal education with a general curriculum, not specifically focused on entrepreneurship. This differs from formal and non-formal education programs that center on entrepreneurship. The primary aim of most entrepreneurship training or education programs is to raise awareness of entrepreneurial activities and impart the necessary knowledge and skills. Previous research has frequently concluded that entrepreneurship education significantly affects entrepreneurial behavior, as shown in studies by Akter & Iqbal (2022), Rauch & Hulsink (2015), and Adeel *et al*. (2023).

Table 2 shows that farming experience has a positive effect on farmers' entrepreneurial behavior. According to Shaheen & Al-Haddad (2018), experience is one of

the dimensions of self-efficacy that positively affects entrepreneurial behavior. High self-efficacy, often demonstrated by extensive experience, fosters entrepreneurial behavior, particularly in the dimension of self-efficacy. Generally, the longer the experience is, the better the skills and abilities of farmers will be, leading to increased confidence in their farming practices. Farmers in Bluto District have between 10 and 40 years of experience growing long pepper.

Table 2 also indicates that group membership positively influences farmers' entrepreneurial behavior. These results suggest that farmer groups play a significant role in nurturing entrepreneurial behavior among farmers. Participation and engagement in farmer groups offer multiple benefits that support and enhance farmers' entrepreneurial behavior. These benefits include the following:

1) Increasing Knowledge and Skills: Farmer groups provide targeted knowledge and skills focused on farming, which is distinct from the more general education offered by formal institutions. This is consistent with Shaheen & Al-Haddad (2018), who identified skills and knowledge as key determinants of entrepreneurial behavior. Kirkley (2016) also emphasized that entrepreneurial behavior cannot occur without the necessary knowledge, skills, and experience. In Bluto District, farmer groups frequently organize training and counseling sessions on various agricultural aspects, such as cultivation techniques, marketing strategies, and farm management, facilitated by local extension officers.
2) Enhancing Access to Information and Resources: Farmer groups facilitate access to crucial information and resources, including commodity prices, agricultural technology, and financial assistance. This aligns with Mair's (2002) research, which demonstrated that access to information and resources positively influences entrepreneurial behavior.
3) Promoting Cooperation and Collaboration: Farmer groups serve as a platform for farmers to collaborate on various activities, such as marketing, processing agricultural products, and farm development. Research by Abeyrathne & Jayawardena (2014) found that group interaction positively impacts the entrepreneurial behavior of farmers within these groups. Farmers in these groups often share information about markets and prices, discuss cultivation challenges and solutions, and collaborate on processing long pepper into value-added products like herbal coffee.

4 Conclusion

Most farmers exhibit entrepreneurial behavior that is adequately categorized across four indicators: future orientation, risk-taking propensity, task and result orientation, and innovation. For the other two indicators—confidence and persistence—most farmers demonstrate strong behavior. The factors influencing farmers' entrepreneurial behavior include farming experience and participation in farmer groups.

The recommendation is focused by strengthening farmer groups by building cooperation and solidarity among members of farmer groups. Good communication and mutual support can improve work efficiency and solve problems collectively. Through farmer groups, each farmer can invite members to develop entrepreneurial skills such as risk management. This will help them take advantage of business opportunities and increase profits through improving farmers' skills and experience. For the next research, other variables can be adapted to describe entrepreneurial behavior in its entirety and by exploring other areas to describe different entrepreneurial behaviors.

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