Millennial Farmers' Entrepreneurship Characteristics and Urban Farming Performance in Semarang City, Indonesia

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Abstract. Urban farming in Semarang, Indonesia, faces challenges as a new generation of millennial farmers emerges. These farmers are expected to leverage technology and innovation to enhance efficiency and sustainability. This study analyses the entrepreneurial traits of millennial farmers and evaluates the effectiveness of urban agriculture in Semarang City. The research involved 86 millennial farmers from urban agriculture in the Mijen District, selected through random sampling. A Likert scale was used to assess the farmers' entrepreneurial characteristics, while the effectiveness of urban agriculture was measured in terms of income and profit. Additionally, the study analyzed the relationship between entrepreneurial traits and the performance of urban agriculture using Spearman's correlation. The findings indicate that the entrepreneurial traits of millennial farmers in Semarang City are significant, earning a score of 86%. During the 2023 planting season, urban agriculture in Semarang City generated an average income of IDR 4,861,701 and a profit of IDR 3,481,433, highlighting the growth potential in this agricultural sector. The study also found a positive correlation between the farmers' entrepreneurial skills and the performance of urban agriculture; farmers with stronger entrepreneurial skills tend to earn higher incomes and profits.

1 Introduction

Urban farming encompasses the processes of growing, processing, and distributing food within urban areas [1]. The government might adopt this farming approach to improve food security, stimulate the local economy, enhance urban ecology, and safeguard social and cultural values in Indonesia [2]. Urban farming is a program aimed at promoting the welfare of communities in city settings [3].

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Data from Semarang City indicates a yearly increase in population. By 2022, the population is expected to reach 1,659,975 individuals and rise to 1,694,743 in 2023, which reflects a growth rate of 0.97 per cent. However, the amount of agricultural land is diminishing, leading to a heightened demand for necessities such as food, clothing, and shelter. The conversion of agricultural land for non-agricultural uses, rapid population growth, and the rise of non-agricultural economic activities threaten food security in urban areas [4].

Since 2017, the Semarang City administration has encouraged urban farming through the Sustainable Food House Area (KRPL) initiatives. However, they encounter several obstacles, including a lack of knowledge and low interest in agriculture among residents, which have hindered the effective implementation of urban farming. Under these circumstances, the demand for innovative urban farming models that can adapt to evolving conditions and ensure food security becomes even more vital [3].

The agricultural sector is fraught with risks and uncertainties, where the role of nature is as significant as the competence and experience of farmers [5]. In this regard, the role of millennial farmers has proven essential in both stable and volatile economic situations [6]. Their capability to manage agriculture in an effective and sustainable manner, along with their continuous contributions to the national economy, underscores the significance of their expertise and their role in enhancing urban farming [7].

The traits and abilities of farmers reflect their effectiveness and sustainability in farm management [8]. The performance of farming refers to the income and profits that farmers generate from their agricultural endeavors. This research concentrates on the performance of urban farming in Semarang City, exploring various aspects of farmer entrepreneurship, such as commitment, foresight, leadership, creativity, and risk-taking. These entrepreneurial qualities impact each farmer's level of competence.

The research intends to explore the relationship between the entrepreneurial traits of millennial farmers and the success of urban agriculture in Semarang City. This study aims to identify the entrepreneurial qualities of millennial farmers, evaluate income and profit metrics, and determine the connection between these entrepreneurial traits and the performance of urban farming in Semarang City.

2 Research method

2.1 Determination of respondents

The study uses the quantitative descriptive research methodology to describe a research object's characteristics and circumstances systematically [9]. It collects opinions, characteristics, and beliefs from samples from a particular population using a quantitative approach to obtain facts about past or present events. The research location, Mijen District, was deliberately selected using purposive sampling, taking into account specific considerations. Mijen District was chosen because it is a district in Semarang City with the highest urban farming in 2023, totaling 342 businesses. There has been an increase in the productive age of the farming profession since 2017. The study adopts a proportional random sampling method, with a population of 186 millennial farmers, resulting in a sample of 65 respondents distributed across five villages in the Mijen District.

2.2 Data analysis

The research used two types of information for the study: primary data, including characteristics of survey respondents, implicit and explicit expenses, urban farming output, land size, labor input from family and non-family members, as well as entrepreneurial traits of the respondents; and secondary data, which encompassed the overall condition of the research area, the extent of urban farming production, and the general status of agriculture. The secondary data was gathered from relevant organizations, such as [specific organizations] known for their expertise in the relevant field. [10].

The data analysis was comprehensive, utilizing descriptive analysis to evaluate the entrepreneurial traits of millennial farmers. The researcher categorized the entrepreneurial traits according to a specified scale using interval calculations and the level was categorized as present in Table 1. This calculation played a crucial role in determining the entrepreneurial score of millennial farmer entrepreneurs, thereby validating our findings in the Mijen District.

Table 1. Evaluation of the entrepreneurial characteristics of millennial farmers

Score	Level
1	Very Weak
2	Weak
3	Moderate
4	Strong
5	Very Strong

Validation and reliability evaluations were performed on the research instruments to ensure they are aligned with the research objectives [11]. The validation test results indicate that all survey questions utilized in this study are deemed valid, confirming that the survey is suitable for this research [12]. Furthermore, a computed *R-value* that exceeds the critical *R-value* at a 5% significance level demonstrates a strong correlation between the survey questions and the research goals [13]. Similarly, the reliability evaluation on all aspects of the research survey, including [list of components], yielded a Cronbach's Alpha value of 0.6, reflecting internal consistency and indicating high reliability and appropriateness for research purposes [14].

Furthermore, urban farming was analyzed, encompassing total expenditure, earnings, income, and profits. A Rank Spearman correlation analysis followed this to establish the strong correlation between millennial farmers' entrepreneurial traits and the performance of urban farming, including income and profit [13].

3 Results and discussion

The respondents in this study consisted of 65 millennial farmers selected through a proportional random sampling method from a total population of 186 millennial farmers distributed across five villages in Mijen District, Semarang City. Most respondents are in the productive age group (20–35 years), with diverse educational backgrounds ranging from senior high school to undergraduate levels. Most have engaged in urban farming for over three years, indicating their growing experience and adaptability to modern agricultural practices. The types of crops cultivated by these millennial farmers are predominantly horticultural commodities, such as leafy vegetables (lettuce, spinach, mustard greens, and kale), fruit vegetables (chili, tomato, and eggplant), and secondary crops like corn and peanuts. In several cases, high-value crops, including herbs and hydroponic vegetables, are also cultivated to meet the increasing demand from urban consumers. This variety of crops reflects the farmers' adaptability to market demands and the suitability of urban farming systems for small-scale, high-turnover agricultural production.

The amount of land dedicated to urban farming during one growing season in Mijen District varies from 120m2 to 580m2. Millennial farmers in Mijen District own an average land area of 255m2. Details about the expenses and earnings related to farming can be found in Table 2.

Table 2. Urban faming income analysis

Description	Unit	Value
Production Cost	IDR	3,395,475
Production	Kg	438
Price for selling	IDR/Kg	18,852
Revenue	IDR	8,257,176

According to Table 2, the income from urban farming is IDR 4,861,701, with a profit of IDR 3,481,433. This allows the millennial farmers in Mijen District to continue operating and developing the potential of their land. The research [8] also shows that the income of farmers in Parigi Motong varies depending on the amount of land they own: the more land owned, the more significant the earnings.

3.1 Determination of respondents

Entrepreneurial millennial farmers' characteristics are crucial in shaping an individual's mindset, fostering innovation, creativity, courage, strong work ethic, and perseverance. These characteristics, when combined with knowledge, skills, and vigilance, play a pivotal role in determining the success of a business, and this holds for millennial farmers as well. Farmers need to maintain optimism, think positively, and nurture a creative spirit to navigate the challenges within their industry effectively. This research examines five traits of entrepreneurial character: dedication, forward-looking mindset, leadership abilities, innovation, and the readiness to embrace risks.

3.1.1 Commitment

The committed millennial farmers in Mijen District demonstrate a solid dedication to agriculture, achieving an average score of 4.24, which categorises them as robust. This finding is consistent with research on the traits and behaviours of millennial farmers in Magelang [4]. These farmers exhibit a strong drive for achievement, a willingness to acquire knowledge through hands-on experience, participation in agricultural training, and a dedication to adopting innovative cultivation techniques.

3.1.2 Forward-thinking

Farmers exhibit a future-focused indicator with an average rating of 3.26, categorizing it as strong. This evaluation encompasses skills, market awareness, and strategic planning. Millennial farmers are actively preparing for the future and taking into account sustainable practices in agriculture. These observations align with research conducted in Malang, which reveal a future-oriented character score of 72% and its connection to entrepreneurial traits and success in farming [15]. Farmers who possess a robust future-oriented character can leverage this attribute to adapt to forthcoming innovations in agriculture [8].

3.1.3 Leadership

The millennial farmers in Mijen District demonstrate significant leadership abilities, with an average score of 4.14, reflecting their strong leadership spirit. Even in the face of challenges such as lower-than-anticipated crop yields during the harvest season and the difficulty in raising commodity prices to boost income, these farmers continue their cultivation with steadfast determination, confidence, and a readiness to take risks, motivating others with their resilience.

A study examining the entrepreneurial skills of organic farmers in Getasan District, Semarang Regency, highlighted the vital importance of leadership for entrepreneurs [11]. Strong leadership traits, such as goal orientation, fostering effective relationships, and enhancing productivity, are advantageous and fundamental for success. This research reinforces the notion that millennial farmers in Mijen District, equipped with strong leadership qualities, are not only in an advantageous position but are almost sure to succeed in their ventures.

3.1.4 Creativity

The creativity level among millennial farmers in Mijen District is noteworthy, with an average score of 3.82. This indicates that most millennial farmers in Mijen District possess innovative ideas for enhancing their agricultural ventures. Significant creativity is crucial for advancing farming practices and boosting the economic situation of farmers, which contributes to a more extensive business development process. This conclusion is drawn from research by [14] regarding the creativity of apple farmers in Malang, who have demonstrated a high degree of innovation in their agricultural practices. Similarly, millennial farmers in Mijen District also showcase creativity in evolving their farming enterprises.

3.1.5 Willingness to take risks

The character of risk-taking courage is rated at 3.55 points, categorizing it as vital. This is attributed to millennial farmers' high creativity and enthusiasm in Mijen District. Their adept use of communication technology is crucial in today's modern era. A study examining the attributes of farmers in Jakarta revealed a significant correlation between the use of information media and business product marketing [8]. This underscores the importance of information media for farmers in gauging market developments, especially for millennial farmers engaged in urban farming in Mijen District, who are increasingly leveraging technology for their development. The entrepreneurial spirit of millennial farmers is clearly visible in their character score:

Table 3. Characteristics of millennial farmer entrepreneurship

No	Variable	Value	Percentage (%)
1	Commitment	4.24	92
2	Forward-thinking	3.26	80
3	Leadership	4.14	92
4	Creativeness	3.82	86
5	Willingness to take risks	3.55	83
Average Score		**3.78**	**86**
Categories		**Strong**	

According to Table 3, millennial farmers in Mijen District demonstrate good entrepreneurial ability, with an overall average score of 3.78 falling within the range of [3.5-5] and a score percentage of 86%. This indicates a high willingness among millennial farmers in Mijen District to engage in urban farming and adopt innovative practices to facilitate and improve farming activities. These farmers utilize information technology to support cultivation operations, while modern sorting tools are used for post-harvest activities to meet market demands.

The millennial farmer's entrepreneurial character is best reflected in the high score of 4.24 for commitment, while the lowest score of 3.26 is for orientation to the future. However, there remains to be some uncertainty about the sustainability of urban farming due to limited market orientation and the need for more support from the government.

3.2 Economic performance of urban farming of millennial farmers

Based on Table 4, it can be observed that millennial farmers involved in urban farming demonstrate varying levels of entrepreneurial character. These levels are categorized as low, middle, and high. Most millennial farmers exhibit a high entrepreneurial character despite facing low average incomes. For instance, a group of twelve farmers, each earning an average of IDR 2,503,183, demonstrates a moderate entrepreneurial nature. This suggests that urban farming, with its potential for growth and sustainability, continues to be a preferred choice over non-agricultural enterprises, even with the prospect of lower earnings.

Table 4. Economic performance of millennial farmers in urban farming

Number of Respondents	Income Level (IDR)			Character
	Low	**Middle**	**High**	
12	2,503,183			Moderate
28		7,263,613		Strong
25			22,681,125	Very Strong
	Profit Rate (IDR)			
9	1,857,173			Moderate
41		4,786,651		Strong
15			20,978,677	Very Strong

Additionally, it is noteworthy that most millennial farmers - constituting 28 individuals - exhibit a robust entrepreneurial character while maintaining an average income of IDR 7,263,613. Their entrepreneurial strength is connected to their capacity to generate more significant quantities of superior goods than farmers with lower integrity. Consequently, their income is positively impacted due to their strong entrepreneurial traits, which contribute to their performance in running their businesses.

Moreover, 25 high-income farmers, with an income of IDR 22,681,125, demonstrate a robust entrepreneurial character and display practical communication skills in discussing urban farming innovations and commodity-selling prices with their peers. By directly selling their crops to consumers, they can command higher prices than if they were to sell their produce to traders. As a result, the higher the level of entrepreneurial character among millennial farmers, the more successful they are in urban farming, leading to increased income and business success.

The average profit earned by nine millennial farmers with sufficient expertise could be much higher at IDR 1,857,173. This is due to the significant expenditure on operational costs for cultivation and land rents, which limits the maximization of profits. Most millennial farmers with a strong character level of 21 have a moderate average profit of IDR 4,786,651. This is because they own a considerable land area in urban farming and produce high-quality products, resulting in higher sales and profits. Additionally, 15 millennial farmers with robust entrepreneurial character have relatively high profits for IDR 20,978,677. They excel in effective farming techniques, leading to high-quality and high-quantity production. Moreover, they market their commodities directly to end consumers, and some have modern agricultural tools, minimizing rental costs. In summary, the stronger millennial farmers' entrepreneurial character, the greater their success in urban farming.

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3.3 The correlation between entrepreneurial and the performance of urban farming

As per Table 5, the characteristics of millennial farmers involved in urban farming, such as their level of education, experience in farming, and access to resources, are connected to the financial performance of the farming activity. The correlation coefficient between urban farming performance and income is 0.407, indicating a positive correlation. Similarly, the correlation coefficient for profit is 0.433, which also shows a positive correlation. These values reveal that the connection between these specific millennial farmers' characteristics and urban farming performance is categorized as weak, signifying a one-way relationship. The weak classification suggests that the influence of these specific millennial farmers' characteristics on their income and profits from farming is minimal. A one-way relationship implies that as these specific farmers' traits increase, their income and profits also increase.

Table 5. Spearman rank results of millennial farmer entrepreneurship characteristics and urban farming performance

Variable	Urban Farming Performance Indicator	Correlation Coefficient (r)	Category	Significance (α = 0.05)
Entrepreneurial Characteristics	Income	0.407	Weak Positive Correlation	Significant
Entrepreneurial Characteristics	Profit	0.433	Weak Positive Correlation	Significant

*Note: *Significant at: 5%*

This suggests that the farmers' entrepreneurial characteristics are adequate for improving the performance of the cultivation business. As millennial farmers' entrepreneurial character strengthens, their ability to manage their farms improves. The income and profits from urban farming leave millennial farmers in Mijen District satisfied, indicating that a dedicated millennial farmer's entrepreneurial character is critical to achieving success.

The analysis reveals a positive correlation between millennial farmers' entrepreneurial characteristics and urban farming performance in Mijen District, Semarang City. The Spearman rank correlation coefficients, 0.407 for income and 0.433 for profit, indicate that stronger entrepreneurial traits such as commitment, leadership, creativity, forward-thinking, and willingness to take risks are associated with higher financial returns from urban farming activities. Although the correlation strength is categorized as weak, the consistent positive relationship suggests that entrepreneurial qualities play a meaningful role in enhancing farming outcomes. Farmers with strong entrepreneurial attributes tend to adopt innovative cultivation techniques, utilize digital platforms for marketing, and implement efficient resource management strategies, leading to increased productivity and profitability. These findings align with previous studies highlight the importance of entrepreneurial capacity in achieving agricultural business success, particularly in urban and resource-constrained environments. However, the relatively low correlation values imply that other external factors, such as market access, policy support, and infrastructure availability, also significantly influence urban farming performance and should be addressed to maximize the potential of millennial farmers.

4 Conclusion and recommendation

This study aimed to examine the relationship between the entrepreneurial characteristics of millennial farmers and the performance of urban farming in the Mijen District of Semarang City. The results show that millennial farmers in the study area demonstrate strong entrepreneurial characteristics, with an average score of 3.78 (86%), indicating high commitment, leadership, creativity, forward-thinking, and willingness to take risks. The analysis of farming performance during one growing season revealed an average income of IDR 4,861,701 and an average profit of IDR 3,481,433, confirming that urban farming activities are financially feasible and viable for millennial farmers.

Furthermore, the Spearman rank correlation analysis indicated a positive relationship between entrepreneurial characteristics and the performance of urban farming, with correlation coefficients of 0.407 for income and 0.433 for profit, though categorized as weak. This finding suggests that while entrepreneurial traits enhance income and profitability, external factors such as market access, infrastructure support, and government facilitation also play critical roles. These results confirm that strengthening entrepreneurial capacities and enabling external support can significantly enhance the productivity and sustainability of urban farming among millennial farmers in Semarang City.

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