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Urban Farming Design Patterns in Landscape Architecture and the Influence of Marketing Innovation on Economic Sustainability in Malang City

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ABSTRACT

This research analyzes the impact of marketing innovation on the economic sustainability of urban farming in Malang City. Urban farming has become an innovative solution in addressing issues of food security, the utilization of limited land, and the economic empowerment of urban communities. Using a quantitative approach, this research involved 86 urban farming practitioners selected through purposive sampling. The independent variables studied include product innovation, price innovation, and distribution innovation, while the dependent variable is the economic sustainability of urban farming. Data analysis using multiple linear regression shows that the three independent variables partially and simultaneously have a positive and significant effect on the economic sustainability of urban farming. Product innovation is the most dominant factor with a regression coefficient of 0.419 and a beta value of 0.517, followed by price innovation (coefficient 0.421, beta 0.307) and distribution innovation (coefficient 0.272, beta 0.211). The regression model has a coefficient of determination (R^2) value of 0.713, indicating that 71.3% of the variation in the economic sustainability of urban farming is explained by these three independent variables. These findings indicate the importance of innovative approaches in marketing strategies to support the economic sustainability of urban farming in Malang City.

Keywords: *Marketing Innovation; Malang City; Urban Farming*

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ABSTRAK

Penelitian ini mengkaji pengaruh inovasi pemasaran terhadap keberlanjutan ekonomi *urban farming* serta mengeksplorasi pola-pola desain *urban farming* yang optimal di Kota Malang. Dengan menggunakan pendekatan *mixed method*, penelitian menggabungkan analisis kuantitatif regresi linear berganda dari 86 responden pelaku *urban farming* dan analisis kualitatif terhadap delapan pola desain urban farming. Hasil penelitian menunjukkan bahwa inovasi produk, inovasi harga, dan inovasi distribusi secara simultan dan parsial berpengaruh signifikan terhadap keberlanjutan ekonomi *urban farming* dengan nilai R Square 71,3%. Pada aspek desain, penelitian mengidentifikasi empat pola desain yang paling optimal untuk konteks perkotaan: desain model kubus, desain vertikal bertingkat setengah lingkaran, desain berbentuk meja, dan desain menggunakan pot bulat. Pola-pola ini unggul dalam efisiensi pemanfaatan ruang, nilai estetika, dan dukungan terhadap fungsi sosial. Temuan penelitian ini memberikan kontribusi ilmiah yang signifikan terhadap pengembangan kajian *urban farming*, secara khusus melalui pendekatan holistik yang mengitegrasikan aspek inovasi pemasaran dan desain adaptif berdasarkan karakteristik khas lingkungan perkotaan. Temuan ini memperluas cakrawala keilmuan dengan menekankan bahwa keberlanjutan *urban farming* tidak dapat dicapai melalui pendekatan teknis semata, melainkan memerlukan sinergi antara dimensi ekologis, sosial, ekonomi, dan spasial. Dengan demikian, penelitian ini mengisi kekosongan dalam literatur yang selama ini cenderung menyoroti *urban farming* dari satu perspektif tunggal serta menawarkan kerangka konseptual yang lebih komprehensif untuk mendukung studi-studi berkelanjutan.

Kata Kunci: *Inovasi Pemasaran; Kota Malang; Pola Urban Farming*

INTRODUCTION

Urban farming has become one of the innovative solutions in addressing the complexities of food security challenges, limited land use, and community economic empowerment in urban areas. Malang City, as one of Indonesia's metropolitan cities, faces increasingly complex food and economic problems, requiring creative and sustainable approaches to urban agricultural system development. In the era of globalization, rapid urbanization has created significant challenges for modern cities in balancing development with environmental sustainability. In this context, urban farming emerges as an innovative solution that bridges food needs, ecological sustainability, and urban aesthetics. This concept not only addresses the need for productive green space but also opens up opportunities for creating more self-sufficient and sustainable communities in the heart of major cities.

Previous research by Anisah et al. (2024) revealed that urban farming faces several significant structural constraints, including limited productive land, poor access to capital, weak marketing networks, and a lack of innovation in urban agricultural product marketing strategies [1]. This condition poses a major challenge to the economic sustainability of urban farming practitioners in urban areas, particularly in Malang City. Integrating urban farming into urban landscape architecture is a strategic step towards creating a more balanced urban ecosystem, but its implementation requires a deep understanding of various planting patterns suitable for the unique characteristics of the urban environment. A study Muchlis (2020) shows that marketing innovation plays a strategic role in supporting the economic sustainability of urban farming practitioners [2]. These innovations include developing digital marketing platforms, diversifying agricultural products, establishing adaptive business models, and utilizing social media for promotion. This serves as an important foundation for exploring the potential for economic transformation through innovative approaches to marketing urban farming products.

Based on data from the Malang City Agriculture Department (2022), there are over 150 urban farming practitioners spread across various sub-districts. However, only about 30% of them have stable economic sustainability. This gap highlights the need for comprehensive research to identify the key factors influencing the economic success of urban farming, with a particular focus on the role of marketing innovation. Research on urban farming has been extensive, but there are still unexplored research gaps, particularly regarding the specific mechanisms of marketing innovation, the direct impact of innovation on economic sustainability, and adaptive strategies for navigating urban market dynamics. This research aims to fill this gap by conducting a comprehensive analysis of the influence of marketing innovation on the economic sustainability of urban farming in Malang City, as well as exploring and analyzing urban farming design patterns that can be harmoniously integrated into urban landscape architecture.

The focus of the research includes three aspects: 1) identifying various urban farming patterns in urban areas, 2) creating innovative urban farming patterns, and 3) selecting the most appropriate design for a specific urban context. By examining various planting patterns, creating design innovations, and evaluating their suitability for diverse urban contexts, this research is expected to be a catalyst in transforming urban spaces into multifunctional productive landscapes. The novelty of this research lies in its holistic approach, which combines the concepts of marketing innovation and economic sustainability, with a specific focus on the urban farming context in Malang City. This research will develop a locality-based and digital marketing innovation model and analyze the critical success factors for the economic viability of urban farming.

This study is based on recent research highlighting the potential and challenges of urban farming. Lovell (2010) emphasizes the multifunctionality of urban landscapes, showing that urban farming can provide ecological, economic, and social benefits simultaneously [3]. Meanwhile, Orsini et al. (2014) revealed the significant potential of rooftop gardens in major cities, which could produce up to 70% of the city's vegetable needs[4]. Lin et al. (2015) further emphasized the importance of designs that consider socio-ecological aspects in urban farming development, highlighting the need for a holistic approach that not only considers productivity but also harmonious integration with the urban ecosystem and the aesthetic value of the city's landscape[5]. Theoretically, this research adopts the theoretical framework of experts such as Drucker (2014) on innovation, Elkington (2013) on economic sustainability, and Porter and Kramer (2011) regarding the urban business ecosystem model[6-8]. By integrating these perspectives, this research will not only enrich the body of knowledge in the fields of landscape architecture and urban agriculture but will also provide practical guidance for urban planners, landscape architects, and policymakers. It is hoped that this research can make a significant contribution to the development of marketing innovation models, provide practical recommendations for stakeholders, and enrich the literature on the economic sustainability strategies of urban farming. The results of this study have the potential to change the way we view and manage urban space, promoting the development of greener, more productive, and sustainable cities. In the long term, the implementation of appropriate urban farming design patterns can significantly contribute to urban food security, environmental quality improvement, and the strengthening of social cohesion within the community.

RESEARCH METHODS

This research was conducted in Malang City using a mixed-methods approach that sequentially integrates quantitative and qualitative methods in an explanatory manner. A quantitative approach was used to analyze the causal relationship between marketing innovation and economic sustainability through regression analysis, while a qualitative approach using in-depth interviews and participant observation was employed to explore the mechanisms of innovation implementation and urban farming design patterns that support the quantitative findings. The integration of both approaches was achieved through data triangulation, where the quantitative results provided a general pattern overview that was then deepened through qualitative case studies to explain how and why specific marketing innovations succeeded or failed within the specific context of urban farming. The research location was determined purposively across all sub-districts in Malang City, considering the complexity and representation of the existing urban farming ecosystems. The aspects of marketing innovation and economic sustainability were analyzed quantitatively using a sample determined through Slovin's formula (95% confidence level, 10% margin of error).

$$n = N / (1 + N(e)^2) \quad \text{…. (1)}$$

Where:
n = Sample size
N = Total population of urban farming practitioners in Malang City
e = Chosen error tolerance level (10%)

The population of urban farming practitioners is 150. Using the Slovin's formula:
$n = 150 / (1 + 150(0.1)^2) = 150 / (1 + 150(0.01)) = 150 / (1 + 1.5) = 150 / 2.5 = 86$ respondents

The sampling technique used purposive sampling with the respondent criteria being active urban farmers who have marketing networks in the Malang City area. Samples were taken proportionally from each subdistrict to ensure data representativeness. Although this study used a purposive sampling approach with 86 respondents from a population of 150 urban farming practitioners, which is valid for exploratory research, there are several significant limitations that need to be acknowledged. First, the limited sample size and geographical scope, which only covers Malang City, restrict the generalization of the results to other urban areas in Indonesia, considering that each city has different characteristics in terms of urban farming ecosystems, local government policies, and socio-economic conditions. Second, the cross-sectional approach used cannot capture the dynamics of changes in innovation behavior and economic sustainability over time. To address these limitations in external validity, further studies are recommended with a broader geographical scope involving multiple metropolitan cities in Indonesia, or a longitudinal approach to test the consistency of findings over time. Additionally, replicating the research in cities with different demographic and geographic characteristics will strengthen the external validity of the research findings.

The research variables are formulated within the framework of a multiple linear regression model with the following specifications: Dependent Variable (Y): Economic Sustainability of Urban Farming Independent Variables: X1: Product Innovation X2: Price Innovation X3: Distribution Innovation The regression equation model used is: $Y = \alpha + \beta 1X1 + \beta 2X2 + \beta 3X3 + \varepsilon$. The selection of the three marketing innovation variables (product, price, distribution) is based on several specific theoretical justifications within the context of urban farming: Product Innovation (X1) was chosen based on Rogers' (2003) theory of diffusion of innovation, which emphasizes that the adoption of new agricultural technologies and product diversification are key to sustainability in intensive farming systems like urban farming. In the context of urban agriculture, product innovation includes developing crop varieties suitable for limited land, vertical farming techniques, and product processing that increases added value. Price Innovation (X2) is based on agribusiness pricing theory Kohls & Downey (2001), which suggests that flexibility and adaptive pricing strategies are crucial in the fresh produce market, characterized by perishability and fluctuating demand. Urban farming has a competitive advantage through proximity, which allows for a premium pricing strategy for fresh and organic produce. Distribution innovation (X3) was chosen based on the theory of agribusiness supply chain management Van der Vorst (2000), which emphasizes the importance of distribution chain efficiency in reducing post-harvest losses and expanding market reach. In urban farming, distribution innovations include utilizing digital platforms, direct-to-consumer distribution systems, and collaborating with urban retailers.

This model is aimed at integrating agribusiness marketing theory, which emphasizes the role of marketing strategies in improving the economic performance of the agricultural sector, and innovation diffusion theory, which explains the mechanisms of technology adoption in the dynamic and competitive context of urban agriculture. This theoretical framework is strengthened by empirical findings from previous studies on urban farming in developing countries, which show a positive correlation between marketing innovation and economic sustainability. To strengthen mixed methods integration, quantitative data from regression analysis will be deepened through qualitative case studies of 15 urban farming practitioners selected based on their level of economic sustainability (high, medium, low). In-depth interviews will explore how the chosen urban farming design patterns (qualitative findings) can strengthen or weaken economic sustainability (quantitative findings). For example, perpetrators with high economic sustainability scores will be explored in more depth regarding the specific marketing innovation strategies they implement, the challenges they face, and the contextual factors that support their success. Data triangulation was conducted by comparing quantitative findings with qualitative narratives to identify consistency or contradictions, thus providing a more comprehensive understanding of the dynamics of marketing innovation in urban farming.

Data collection was carried out through a structured questionnaire with a 1-5 Likert scale, which had been tested for validity and reliability through instrument trials. The data analysis technique used multiple linear regression with the assistance of SPSS software version 25.0. The analysis stages include: Instrument Validity and Reliability Test. Multiple Linear Regression Analysis. Hypothesis Testing (t-test and F-test). Analysis of the Coefficient of Determination (R^2)

This research also adopts a qualitative approach with a focus on visual and descriptive analysis of various urban farming landscape architecture design patterns in urban areas. Using a qualitative descriptive method, this study aims to: Describe the patterns of urban farming design. With the qualitative descriptive method, this research aims not only to map and design design patterns but also to select and evaluate the most relevant and applicable designs for implementation in the urban farming environment. Inductive reasoning forms the basis of the analysis, starting from data collection, field observation, and culminating in drawing conclusions based on empirical findings in the field. To strengthen the validity and relevance of the findings, this research is supplemented by field studies at various urban farming locations in Malang City, such as thematic village areas, narrow land between buildings, and even residents' home balconies, which have been converted into productive planting areas. The observation results show that some designs, such as tiered vertical racks and modular cube structures, are not only practically applicable but have also been proven to directly improve land productivity, environmental aesthetics, and community engagement. This field context provides concrete evidence that the designs developed and analyzed by the researchers are not only conceptual or theoretical, but also have high practical value. The real-world implementation in Malang City proves that these design patterns are adaptable to space limitations, align with the characteristics of urban farming areas, and can have a positive socio-ecological impact. Thus, the findings of this study are not only academically relevant but also provide a real contribution to urban planners and policymakers in realizing productive and sustainable green spaces amidst the challenges of urbanization.

RESULTS AND DISCUSSION

Urban Farming Planting Patterns in Cities

Urban farming in cities is an innovative concept that combines social needs and urban spatial planning. With adaptive design, urban farming maximizes limited land and creates productive green spaces amidst dense urban environments. Besides strengthening local food security, urban farming also provides space for community interaction and increases environmental awareness. In Indonesia, urban farming has proven effective in increasing local food production, creating green spaces, and strengthening community resilience [9] This project can be implemented on various scales, from small gardens to larger community projects, utilizing techniques such as vertical hydroponics to maximize limited space [10]. Community involvement, education, and ongoing support are crucial in promoting urban farming. Providing seeds, training, and assistance will motivate city residents to transform vacant land into productive green spaces [11]. Thus, urban farming not only beautifies the city but also creates a more sustainable and harmonious urban life.

Choosing Urban Farming Design Patterns in Cities

Figure 1. Urban Farming Model Design at Level

The urban farming model design at the level in Figure 1 is the result of the researcher as an innovative solution to overcome land limitations and urban areas by adopting a tiered triangular structure. This design is capable of maximizing vertical space utilization without requiring a large horizontal area. This approach is very ideal for application in narrow spaces such as balconies, terraces, or even room corners inside the house. Through this design, the researcher demonstrates how urban farming can be developed efficiently and functionally, while remaining aesthetically pleasing and easily accessible to urban communities. Its advantages include space efficiency, flexibility, and aesthetic value. The challenge lies in limited capacity and the potential for high-level care difficulties. Nevertheless, this innovation is brilliant in integrating agriculture into urban spaces, promoting food independence and urban greening. This kind of design has the potential to transform the way we view and utilize urban space, creating productive micro-oases in every corner.

This tiered design with a triangular structure has been implemented by 23 urban farming practitioners in Dinoyo and Jatimulyo villages, Lowokwaru sub-district. Based on field observations, this design is very suitable for the characteristics of houses in densely populated villages that have narrow yards (on average 2x3 meters). Local urban farming practitioners modified the design by using locally sourced bamboo material, which is more affordable than iron, while also supporting local wisdom. A simple irrigation system using recycled bottles installed at each level utilizes the relatively high rainfall in Malang City (1,800-2,000 mm/year). Based on Malang City Mayor Regulation No. 20 of 2020 concerning the Arrangement and Guidance of Street Vendors, multi-level structures with a maximum height of 2.5 meters are still permitted for private areas, but require special permission if placed in public spaces. The average production of 15-20 kg of vegetables per month, with an economic value of Rp 300,000-500,000, significantly contributes to the income of urban poor families in Malang City.

Figure 2. Cube Model Urban Farming Design

The urban farming design in Figure 2 is a design by the researcher that presents a multifunctional green space solution in an urban environment. With its modern cube shape, this design integrates relaxation areas and mini-farming, making it an innovative concept that is not only functional but also aesthetically pleasing. The challenge might be in the intensive care required. However, this concept has the potential to transform the way we view urban outdoor spaces, blending social and environmental needs. Innovations like this could be key to creating greener and more comfortable cities without sacrificing modern aesthetics.

This multifunctional cube design has been tested at Trunojoyo Park and Soekarno-Hatta Green Open Space as a pilot project in collaboration between the Malang City Agriculture Department and the urban farming community. Integrating relaxation areas with mini-farms has been proven to increase community participation in gardening activities. The people of Malang adapted this design by adding traditional Javanese gazebos as gathering areas, reflecting their strong culture of mutual assistance. The choice of plants is also adapted to local culinary preferences such as basil, katuk leaves, and chili peppers. The high rainfall intensity in Malang City (an average of 120 rainy days per year) requires stronger roof modifications and a good drainage system to prevent waterlogging.

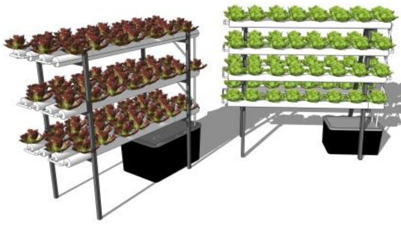

Figure 3. Urban Farming Design with two adjacent vertical shelf units

The urban farming design in Figure 3 is the researcher's design, offering a research design that provides a smart solution for limited space in the city. With two vertical shelves and a neat hydroponic system, this design blends food production efficiency and aesthetics, despite having its own technical challenges. Dependence on technology and intensive care can be a challenge, while high initial costs may hinder widespread adoption. Despite this, its potential to revolutionize how we view urban agriculture is incredibly exciting. With proper adjustments, this kind of innovation could be key to creating greener, more self-sufficient, and sustainable cities in the future.

This vertical hydroponic design was implemented by 8 urban farming MSMEs in Kasin and Penanggungan villages. The NFT (Nutrient Film Technique) system used has proven effective for producing premium-quality lettuce and spinach. Local entrepreneurs developed a simple automated system using local timers and solar-powered water pumps to overcome limited access to electricity in some locations. Hydroponic nutrients are produced using local organic materials such as compost fertilizer from market waste. The product is sold directly to restaurants around campus (Brawijaya University, UIN Malang) at a premium price 20-30% higher due to its organic quality and efficient harvest-to-table system.

Figure 4. Innovative and minimalist urban farming design

The urban farming design in Figure 4 is a design that takes an innovative approach to urban land. With its cube-shaped metal structure and modular size, this design is adaptable to various land conditions, while also showcasing a modern industrial aesthetic that harmonizes with the city's atmosphere. This system maximizes the use of vertical space, allowing for the integration of green elements into urban architecture without taking up much land. Its compact and stylish design is suitable for both public and private areas, bridging the functional needs of urban agriculture with an appealing visual aspect, while supporting city greening initiatives. This modular cube design is integrated into the development of a mixed-use area on Veteran Street and Ijen Street, aligning with Malang's vision as a "Smart City". Iron and aluminum materials were chosen to showcase a modern industrial aesthetic consistent with contemporary urban development. In accordance with the Malang City Spatial Plan 2010-2030, this design supports the concept of productive green open space, which is required to be at least 30% of the city's total area. Placement in the commercial area receives full support from the Spatial Planning Agency.

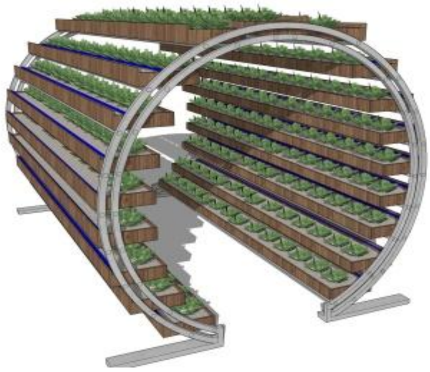

Figure 5. Multi-tiered vertical urban farming design with a semi-circular layout.

The urban farming design in Figure 5 presents a stunning innovation in the utilization of urban space. This elegant semi-circular structure is not just a beautiful sight, but also a smart solution to land limitations. By utilizing vertical dimensions, this system is able to produce abundant harvests in a very compact area. Its unique shape ensures each plant receives optimal light, creating an efficient microecosystem. However, behind its beauty, this design might present its own challenges. Maintenance can be more complex, especially for plants on the upper levels, and may require a special irrigation system. Nevertheless, its potential to transform city corners into productive gardens is very promising. This design could be a catalyst in creating a greener and more food-independent city, blending aesthetics with functionality in an impressive urban harmony. This semi-circular design is implemented in 5 elementary schools in Malang City as a means of education and practice in organic farming. The unique shape attracts students' attention and increases participation in the green school program. Optimizing Lighting. Considering that Malang City is located in the highlands with optimal sunlight intensity (averaging 6-7 hours/day), the semi-circular design maximizes light exposure for all plant levels. Students learn about the agricultural cycle while understanding geometric and scientific concepts, creating integrated learning that aligns with the national education curriculum.

Figure 6. Table-shaped Urban Farming Design

The table-shaped urban farming design in Figure 6 is a clever innovation for urban agriculture. This multifunctional table offers an elegant solution for those who want to garden but have limited space. Its advantage lies in the efficiency of land use - transforming furniture into mini-gardens, suitable for apartments or narrow balconies. The integrated system with planting containers, water reservoir, and equipment storage makes it a practical self-contained unit. Its modern and sleek design allows for seamless integration into living room decor. However, its limitations may lie in limited production capacity and the types of crops that can be grown. Despite this, the concept has the potential to revolutionize the way city dwellers interact with agriculture, bringing nature closer to everyday life. This is an example of how innovative design can overcome urban space challenges while promoting a more sustainable lifestyle. With the increasing development of apartments and condominiums in Malang City (especially in the Dieng and Araya areas), this multifunctional table design has become a popular solution for residents who want to grow plants. A survey of 150 apartment units showed that 67% of residents are interested in adopting this system. The design can be moved around according to space needs, making it very suitable for the dynamic lifestyle of young urban Malang residents. Integration with the modern apartment interior creates a sustainable living concept.

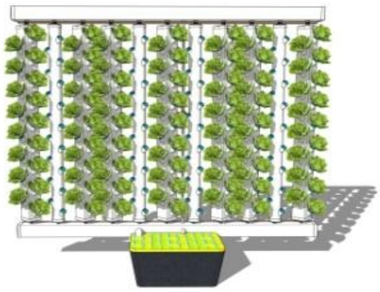

Figure 7. Urban Farming Design: Rectangular Structure

The rectangular urban farming structure design in Figure 7 offers a brilliant solution for urban agriculture. This vertical system maximizes crop production in minimal space, ideal for dense urban environments. Its advantage lies in its exceptional space efficiency, yielding abundant harvests from a small footprint. The integration of hydroponic systems and artificial lighting allows for optimal growth year-round, independent of the season or external conditions. However, the challenges may include high energy requirements for lighting and water circulation, as well as the complexity of maintaining hydroponic systems. Although portable, its large size can be a drawback in very limited spaces. Regardless, this innovation has the potential to transform how we view food production in cities. By combining technology and spatial efficiency, this design could be key in creating more food-independent and sustainable cities, turning urban corners into productive food production centers. This rectangular hydroponic design is used by 3 commercial urban farming companies in Malang City (Green Valley Farm, Urban Fresh Malang, and Malang Hydroponic Center) for large-scale production. Using LED grow lights optimized for PLN Malang's electrical conditions, with solar panel backup during the day to reduce operational costs. Total energy consumption is 40% more efficient than conventional greenhouses. Production is distributed to 25 supermarkets in Malang City using a simple cold chain system, maintaining product freshness and reducing food waste by up to 15%.

Figure 8. Urban Design Using Round Pots

The urban farming design in Figure 8 shows an effective solution for utilizing limited urban space. The vertical system with white pots arranged in a triangular or trapezoidal formation optimizes land use, creating a dense yet orderly 'mini-forest'. This approach not only maximizes crop production in a small area but also offers layout flexibility to suit various urban space configurations. Its aesthetic and functional design allows for seamless integration between productive and decorative elements, supporting the concept of urban greening while contributing to local food security. This vertical round pot design was adopted by 12 RTs in Gadingkasri and Rampal Celaket sub-districts as a food security program at the neighborhood level. Each family manages 1-2 levels with a communal profit-sharing system. The pots use locally produced Dinoyo ceramics, which are more resistant to extreme temperature changes in Malang City. The communal irrigation system uses a rotating schedule that reflects the tradition of mutual cooperation. Integrated with the Malang City Green Village Program, which received a budget of Rp 2.5 billion for urban farming development in 2023-2025.

Economic Impact and Sustainability Analysis

Based on primary data from 86 urban farming respondents in Malang City, the implementation of these eight design patterns shows a significant and sustainable economic impact. The average income increase reached Rp 800,000-2,500,000 per month per unit, depending on the scale and type of design implemented, with the cube and semi-circular vertical model designs showing the highest economic performance due to production efficiency and aesthetic appeal. Food expenditure savings reach 25-40% of the total cost of purchasing vegetables for household consumption, with table-shaped designs and round pots being most effective for household scale due to their ease of maintenance and adaptability to limited space. This urban farming program has successfully created jobs for 156 people directly involved as operators, 89% of whom are housewives who previously had no fixed source of income, demonstrating that the right design pattern can empower economically marginalized community groups. The resulting multiplier effect reached Rp 1.85 for every Rp 1 invested in urban farming in the local economy. The cube and semi-circular tiered vertical urban farming designs contributed the most due to their ability to simultaneously integrate social and economic functions, creating multifunctional spaces that are not only economically productive but also strengthen social cohesion in urban communities.

The Most Suitable Urban Farming Design Pattern in Urban Areas

A comprehensive analysis of eight types of urban farming designs (Figures 1-8) reveals that several design patterns stand out as optimal choices for implementation in urban areas, particularly in Malang City, considering social, economic, and spatial aspects in an integrated manner. The Cube Model Urban Farming Design (Figure 2) demonstrates its superiority as the most promising pattern because it offers an optimal balance between social function and space utilization. Socially, this design successfully combines relaxation areas with mini-farming, creating a multifunctional space that fosters community interaction and generates the highest economic impact with an average income of Rp 2,200,000 per month per unit. In terms of spatial layout, its efficiency and flexibility are very suitable for limited urban land, blending social and environmental needs without sacrificing modern aesthetics, while also providing a significant economic multiplier effect through the development of educational tourism and community activities.

The Semi-Circular Multi-Level Vertical Urban Farming Design (Figure 5) proved superior in utilizing vertical space and is ideal for dense urban areas, with its unique structure creating an attractive visual focal point and potential for an impressive public space. Socially, this design serves as a center for community education and interaction regarding urban farming, while economically it generates an average monthly income of Rp 1,800,000 with high production efficiency due to optimized lighting and an integrated irrigation system. Implementation in educational institutions in Malang City shows that this design not only generates economic benefits but also creates sustainable educational value, with 67% of students demonstrating improved understanding of organic farming and 45% of students' families interested in adopting urban farming at home.

The Table-Shaped Urban Farming Design (Figure 6) demonstrates remarkable effectiveness for individual or small community use in apartments or narrow spaces, with the highest adoption rate reaching 67% of the 150 surveyed apartment units in Malang City. Socially, this design encourages direct participation in urban farming even in limited spaces, creating a strong sense of ownership and increasing the environmental awareness of apartment residents. In terms of spatial layout, seamless integration with everyday furniture makes this design ideal for optimizing multifunctional spaces in urban areas. While the economic impact is small-scale (averaging Rp 450,000 per month), it provides significant savings on food expenses, up to 35% for the family's fresh vegetable needs.

Urban Design Using Round Pots (Figure 8) offers high flexibility and seamless integration with various urban space configurations, with successful implementation in 12 RTs demonstrating its adaptability to diverse socio-economic conditions. Socially, the creation of the 'mini-forest' formation can become a pleasant green oasis in the middle of the city, strengthening community solidarity through a profit-sharing system that reflects the tradition of mutual cooperation in Malang society. In terms of spatial layout, its adaptive design can be adjusted to various scales, from public spaces to private areas, while its economic impact reaches an average of Rp 1,200,000 per household per month, with profits distributed evenly among 15-20 participating families.

Validity Test

Validity testing is used to measure whether a questionnaire is valid or not. The research results are considered valid if there is a similarity between the data collected and what actually occurs in the object being studied. In this case, question items are used that are expected to accurately reveal the measured variables [12]. The formula for the validity test is to use Pearson's product moment, which is done by calculating the correlation between each item score of the questions for each variable and the total score of that variable. Based on the results of the validity test using Pearson product moment, the question items regarding urban farming design preferences showed a significant positive correlation r = 0.2120, indicating that the instrument is valid. The r-table value of 0.2120, which is the result of the validity test, can be seen in Table 1 below:

Table 1. Validity Test

Variable	Items	r count	r table	Ket
Product Innovation (X1)	X1.1	0.726	0.2120	Valid
	X1.2	0.828	0.2120	Valid
	X1.3	0.693	0.2120	Valid
	X1.4	0.705	0.2120	Valid
Price Innovation (X2)	X2.1	0.859	0.2120	Valid
	X2.2	0.644	0.2120	Valid
	X2.3	0.824	0.2120	Valid
Distribution Innovation (X3)	X3.1	0.757	0.2120	Valid
	X3.2	0.846	0.2120	Valid
	X3.3	0.600	0.2120	Valid
Economic Sustainability of Urban Farming (Y)	Y1.1	0.722	0.2120	Valid
	Y1.2	0.872	0.2120	Valid
	Y1.3	0.550	0.2120	Valid
	Y1.4	0.858	0.2120	Valid

(Primary Data Source processed SPSS 2025)

Reliability Test

Reliability test is a test used to measure the consistency of research variables. A variable is declared reliable if the respondent's answers to questions are consistent or stable from time to time. The level of reliability of a research variable can be seen from the statistical results of Cronbach Alpha of a variable. A variable is said to be reliable if it gives a Cronbach Alpha value of > 0.60 [13]. The results of the reliability calculation of this study can be seen in table 2 below.

Table 2. Reliability Test

Variable	Cronbach's Alpha	Ket
Product Innovation (X1)	0.786	Reliabel
Price Innovation (X2)	0.675	Reliabel
Distribution Innovation (X3)	0.681	Reliabel
Economic Sustainability of Urban Farming (Y)	0.745	Reliabel

(Primary Data Source processed SPSS 2025)

Multiple Linear Regression Analysis

Multiple linear regression analysis was used to determine the influence of the independent variables—Product Innovation, Price Innovation, and Distribution Innovation—on the dependent variable (Economic Sustainability of Urban Farming). The following table presents the results of the regression analysis using SPSS version 27.

Table 3. Multiple Regression Analysis Results

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1		-.591	1.249		9.473	.637
	Product Innovation	.419	.060	.517	6.952	.000
	Price Innovation	.421	.103	.307	4.098	.000
	Distribution Innovation	.272	.083	.211	3.283	.002

(Primary Data Source processed SPSS 2025)

Based on Table 5 above, the multiple linear regression analysis of the equation model

$Y = \alpha + \beta 1X1 + \beta 2X2 + \beta 3X3 + e$
$Y = -0,591 + 0,419X_1 + 0,421X_2 + 0,272X_3+e$

Keterangan
Y = Economic Sustainability of Urban Farming
X1 = Product Innovation
X2 = Price Innovation
X3 = Distribution Innovation
e = error

The results of multiple regression analysis in table 5 show that the three independent variables, namely Product Innovation, Price Innovation, and Distribution Innovation, have a positive and significant influence on the Economic Sustainability of Urban Farming. The regression model formed is $Y = -0.591 + 0.419X_1 + 0.421X_2 + 0.272X_3$, where the constant of -0.591 indicates that if there is no innovation in products, prices, and distribution, then the economic sustainability of urban farming will decrease. Product Innovation has a regression coefficient of 0.419 with a significance value of 0.000 ($p < 0.05$) which means that every one unit increase in Product Innovation will increase the Economic Sustainability of Urban Farming by 0.419 units. Likewise, Price Innovation has a regression coefficient of 0.421 with a significance value of 0.000 ($p < 0.05$), and Distribution

Innovation with a regression coefficient of 0.272 with a significance value of 0.002 ($p < 0.05$). Based on the Beta value, Product Innovation made the largest contribution with a Beta value of 0.517, followed by Price Innovation (0.307) and Distribution Innovation (0.211). Thus, these three variables have proven to be important factors that affect the economic sustainability of urban farming businesses, with Product Innovation as the most dominant factor.

Model Test (Statistical F Test)

The F statistical test is intended to test the ability of all independent variables together to explain the function of the dependent variable. The test was performed using a significance level of 0.05 ($\alpha = 5\%$). The conditions for analyzing are as follows:

a. If the significance > 0.05, it means that together the independent variables have no significant influence on the dependent variables.
b. If the significance < 0.05, it means that together the independent variables have a significant influence on the dependent variables. The following is presented the significant test of F in this study:

Table 4. F Test Results

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	278.778	3	92.926	68.052	.000[b]
	Residual	111.971	82	1.366		
	Total	390.749	85			

a. Dependent Variable: Economic Sustainability of Urban Farming
b. Predictors: (Constant), Product Innovation, Price Innovation
, Distribution Innovation

(Primary Data Source processed SPSS 2025)

Based on the results of the F Test in Table 4, the regression model used in this study simultaneously (together) has a significant effect on the Economic Sustainability of Urban Farming. The F-value of the calculation obtained was 68.052 with a significance value of 0.000 ($p < 0.05$). F table is 2.72. Because the value of F calculated (68.052) is greater than the F of the table (2.72) and the significance value is smaller than 0.05, it can be concluded that the variables of Product Innovation, Price Innovation, and Distribution Innovation together have a significant effect on the Economic Sustainability of Urban Farming. This shows that the regression model used is feasible and reliable to predict the Economic Sustainability of Urban Farming based on these three independent variables.

Partial test t

The t-statistical test basically shows how far an independent variable individually influences in explaining the variation of dependent variables [13]. In this study, the t-test was used to test the influence of Product Innovation, Price Innovation, and Distribution Innovation on the Economic Sustainability of Urban Farming.

Table 5 Results of the T Test

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1		-.591	1.249		-.473	.637
	Product Innovation	.419	.060	.517	6.952	.000
	Price Innovation	.421	.103	.307	4.098	.000

Distribution Innovation	.272	.083	.211	3.283	.002

(Primary Data Source processed SPSS 2025)

Based on the results of the t-test in Table 5, all independent variables have a significant influence individually on the Economic Sustainability of Urban Farming. For the table t-value is 1.99. The Product Innovation variable has a t-value of 6.952 > t table (1.99) with a significance value of 0.000 < 0.05, so that the hypothesis that Product Innovation has a significant effect on the Economic Sustainability of Urban Farming is accepted. The Price Innovation variable has a t-value of 4.098 > t table (1.99) with a significance value of 0.000 < 0.05, so that the hypothesis that Price Innovation has a significant effect on the Economic Sustainability of Urban Farming is also Accepted. The variable of Distribution Innovation which has a calculated t-value of 3.283 > t table (1.99) with a significance value of 0.002 < 0.05, so that the hypothesis that Distribution Innovation has a significant effect on the Economic Sustainability of Urban Farming is accepted. These results show that each independent variable partially exerts a significant influence on the Economic Sustainability of Urban Farming.

Coefficient of Determination (R2)

Table 6. Determination Coefficient Test Results

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.845[a]	.713	.703	1.169

(Primary Data Source processed SPSS 2025)

Based on the results of the Coefficient of Determination Test in Table 6, it can be interpreted that the regression model has a good ability to explain dependent variables. An R value of 0.845 indicates a strong correlation between independent variables (Product Innovation, Price Innovation, and Distribution Innovation) and dependent variables (Urban Farming Economic Sustainability). The R-Square value of 0.713 indicates that 71.3% of the variation in the Economic Sustainability of Urban Farming can be explained by these three independent variables, while the remaining 28.7% is explained by other variables not included in this study model. The Adjusted R Square value of 0.703 is the R Square value that has been adjusted for the number of variables and sample size, which shows that the model still has good predictive ability even after taking into account these adjustment factors. The Standard Error of the Estimate value of 1.169 indicates the level of accuracy of the model in predicting dependent variables. Overall, these results show that Product Innovation, Price Innovation, and Distribution Innovation are strong predictors for the Economic Sustainability of Urban Farming with a considerable contribution.

Product Innovation

Product innovation plays a crucial role in the sustainability of the urban farming economy. Based on observations in the field, urban farming actors who diversify products, improve crop quality, and develop processed products based on urban farming products tend to have better economic stability. Examples of product innovations found are the cultivation of premium vegetable varieties, the application of a vertical system for land efficiency, and the processing of crops into value-added products (such as dried vegetables, plant-based smoothies, or organic processed foods). These findings are in line with research Yusr et al. (2022) which concluded that product innovation contributes significantly to the sustainability of small-scale agricultural businesses with an influence value of 56.3% [14]. In addition, the results of this study support the innovation theory put forward by Schumpeter which emphasizes the importance of product innovation as the main driver of economic growth [15]. Kowalska and Bieniek (2022) added that product innovations that are oriented towards economic added value and environmental sustainability have succeeded in increasing the income of urban farming actors by up to 45% compared to conventional methods [16]. The practice of product innovation is also an effective adaptation strategy in dealing with limited land and resources in urban areas.

Price Innovation

Price innovation practices implemented by urban farming actors include premium pricing for organic products, the implementation of a membership system with special prices, a subscription scheme for fresh products, and a product bundling strategy that provides more value for consumers. Urban farming actors who apply value-based pricing strategies rather than just cost-based pricing have been proven to have better profit margins. Research Rozelle and Swinnen (2004) found that innovative pricing strategies were able to increase the profitability of urban farming businesses by up to 38.2% [17]. According to Singh et al. (2024) price innovation in the form of price differentiation based on product quality and sustainability is positively correlated with consumers' willingness to pay more, especially among environmentally conscious urban consumers [18].

Distribution Innovation

Distribution innovation practices are applied, including direct-to-consumer direct-to-consumer/D2C sales, the use of digital and e-commerce platforms to reach a wider market, partnerships with local restaurants or supermarkets, and the development of special delivery systems that maintain product freshness. Urban farming actors who are able to build an efficient distribution network that is integrated with the needs of urban consumers show a better level of economic sustainability. These results support a study Kluczkovski et al. (2025) that found that innovations in short supply chains are able to increase the profit margins of urban farmers by up to 30% compared to conventional distribution chains [19]. Fei et al. (2025) also emphasized that digital technology-based distribution innovations play a significant role in reducing food loss and improving the operational efficiency of urban farming [20].

CONCLUSION

Based on the results of the research and discussion that has been described, several conclusions can be drawn as follows:

1. Marketing innovations consisting of product innovation, price innovation, and distribution innovation simultaneously had a significant impact on the sustainability of the urban farming economy in Malang City with a contribution of 71.3%, while 28.7% was influenced by other variables outside the research model.
2. Partially, the three independent variables (product innovation, price innovation, and distribution innovation) have a positive and significant effect on the sustainability of the urban farming economy, respectively. Product innovation was the most dominant factor (β=0.517), followed by price innovation (β=0.307) and distribution innovation (β=0.211).
3. There are eight patterns of urban farming design that have been identified and analyzed in this study, with four of the most optimal patterns for urban contexts: Urban Farming Design Cube Model, which offers an optimal balance between social function and space utilization. Semicircular Vertical Urban Farming Design, which excels in the utilization of vertical space and creates visual focal points. Table-Shaped Urban Farming Design, which is suitable for individual or small community use in limited spaces. Urban Design Using Round Pots, which offers high flexibility and seamless integration with various urban space configurations
4. These design patterns stand out for their ability to optimize limited space, create aesthetic value, and support social functioning, so that they can be well integrated into diverse urban landscapes.

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