West Science Interdisciplinary Studies
Vol. 02, No. 10, October and 2024: pp. 2054-2064

Influence of Sustainable Agriculture Practices, Water Management, and Organic Seedling Availability on Yields in Bandung Regency Organic Farms

Eddy Silamat[1], Hernawati[2], Rival Pahrijal[3]
[1] Pat Petulai University and eddysilamat9@gmail.com
[2] Agrotechnology Study Program, Faculty of Agriculture, Nahdlatul Wathan University Mataram and ernawati68459@gmail.com
[3] Nusa Putra University and rival.pahrijal_mn21@nusaputra.ac.id

ABSTRACT

This study investigates the impact of organic seedling availability, sustainable agriculture practices, and water management on the yields of organic farms in Bandung Regency. Using a quantitative approach, data were collected from 230 organic farmers and analyzed using Structural Equation Modeling (SEM) with Partial Least Squares (PLS). The results reveal that all three factors significantly and positively affect farm yields. Water management had the strongest influence, followed by organic seedling availability and sustainable agriculture practices. These findings highlight the critical role of resource management in enhancing the productivity of organic farms. The study suggests that improving access to organic seedlings, promoting sustainable farming techniques, and investing in efficient water management systems can lead to better farm performance and sustainability. The research offers practical insights for policymakers and agricultural stakeholders seeking to optimize organic farming in the region.

Keywords: *Organic Seedling Availability, Sustainable Agriculture Practices, Water Management, Organic Farm Yields, Bandung Regency*

1. INTRODUCTION

Organic farming is increasingly recognized as a vital component of sustainable agriculture, offering methods that minimize chemical inputs and enhance ecosystem services. This approach addresses global environmental challenges, supports food security, and accommodates population growth. Organic farming practices focus on improving soil health, reducing harmful residues in food, and promoting biodiversity, thereby contributing to a more sustainable agricultural system. Organic farming excludes synthetic fertilizers and pesticides, reducing environmental pollution and enhancing soil health through natural fertilizers like composts and green manures [1], [2]. It supports biodiversity by fostering a robust soil microbiome, essential for nutrient cycling and soil vitality [1], while sustainable land management helps preserve soils, water resources, and biodiversity, mitigating climate change effects [3]. Organic produce also contains lower levels of harmful residues, offering health advantages by reducing potential risks and providing superior nutritional value through higher levels of essential nutrients [1]. Furthermore, organic farming enhances the economic viability of small-scale farmers by allowing them to command higher prices, contributing to long-term food security through sustainable agricultural practices [4], [5].

The shift towards organic farming in Bandung Regency is driven by environmental and health concerns, yet farmers face challenges in optimizing yields. Sustainable agriculture practices are essential for success, requiring a multifaceted approach that includes soil health maintenance, biodiversity conservation, and reduced environmental degradation. Effective water management and access to high-quality organic seedlings are crucial components. The transition from conventional to organic farming involves significant changes in practices, impacting both sustainability and food quality, with regulatory frameworks and financial considerations playing key roles [6], [7]. Technological advancements and knowledge dissemination also facilitate this transition by mitigating potential drawbacks [6]. Sustainable agriculture integrates economic, ecological, and social perspectives, using strategies like farm diversification and reduced chemical use to improve farmer welfare and environmental outcomes [8]. In West Bandung Regency, permaculture offers a scientific solution for sustainability by enhancing soil fertility and economic viability [7]. Organic farming techniques, such as biofertilizers and crop rotation, further promote soil health and biodiversity, while certification ensures the authenticity of organic products [9], [10].

Efficient water management is crucial for agricultural sustainability, especially in regions with limited water resources or seasonal variations. This is particularly important in organic farming systems, where organic seedlings, free from chemical treatments and GMOs, are vital inputs for producing high-quality, sustainable crops. The integration of advanced water management techniques significantly enhances the viability of these farming systems. Precision agriculture, using GPS, remote sensing, and data analytics, optimizes irrigation to reduce water waste [11]. Drip irrigation minimizes evaporation and runoff, crucial for water conservation in organic farming [11], while soil moisture sensors provide real-time data to ensure efficient water use [11]. Sustainable water-use behaviors, aligned with SDG 6.4, are essential for achieving efficiency [12], and technological advancements, like hydrogel technology and solar-powered irrigation, offer effective conservation solutions [13]. Government policies and community engagement further promote the adoption of sustainable water management practices [13], [14].

This study seeks to investigate the combined effect of sustainable agriculture practices, water management, and the availability of organic seedlings on the yields of organic farms in Bandung Regency. By understanding the relationship between these factors and farm productivity, we can provide insights into the most effective strategies for promoting sustainability and enhancing crop yields in the organic farming sector. Furthermore, this research contributes to the growing body of knowledge on sustainable agriculture, offering evidence-based recommendations for policymakers, agricultural extension workers, and farmers alike.

2. LITERATURE REVIEW

2.1 Sustainable Agriculture Practices

Sustainable agriculture, including organic farming, is vital for meeting current food needs while ensuring future generations can do the same. It prioritizes environmental health, economic viability, and social equity by reducing chemical inputs, maintaining soil health, and conserving resources. Practices like crop rotation, integrated pest management, and conservation tillage improve soil health, reduce water usage, and minimize agrochemical inputs, boosting productivity and environmental stewardship [4], [5]. Organic farming, a subset of this approach, avoids synthetic pesticides and fertilizers, using natural methods that lead to higher yields and improved soil health [1]. It promotes biodiversity, protects resources, and mitigates climate change by reducing greenhouse gas emissions [3]. Economically, it increases farmers' profitability and allows small-scale farmers to command higher prices due to rising demand for organic products [1], [4]. While it supports socio-economic progress by aligning with the UN

Sustainable Development Goals, adoption is hindered by limited knowledge and resources, especially in developing regions, emphasizing the need for more support [4].

2.2 Water Management in Agriculture

Effective water management is a cornerstone of sustainable agriculture, particularly in regions facing water scarcity or irregular rainfall. Techniques such as drip irrigation, rainwater harvesting, and mulching optimize water use, reduce wastage, and maintain soil moisture, which are essential for crop growth [13]. These practices not only enhance water use efficiency but also contribute to higher yields and reduced input costs, as highlighted by various studies. Drip irrigation systems, for instance, deliver water directly to plant roots, minimizing evaporation and runoff, thus improving efficiency [11]. Precision agriculture, using GPS and data analytics, further optimizes irrigation practices and boosts crop productivity [11]. Technological innovations like AI-powered irrigation systems and soil moisture sensors enhance water retention and scheduling based on real-time data [11], [15]. Agronomic strategies, including mulching and drought-resistant crop varieties, improve water-use efficiency, especially in arid regions [11], [16], making these techniques crucial for sustainable, water-efficient farming.

2.3 Organic Seedling Availability

The availability and quality of organic seedlings are vital for the success of organic farming systems, as they maintain organic integrity throughout the production cycle. High-quality organic seedlings, more resilient to diseases and climate variations, contribute to higher yields. However, in regions like Indonesia, limited access to certified organic seeds poses challenges for farmers transitioning to organic practices, often forcing them to use conventional seedlings that underperform in organic systems due to their reliance on chemical inputs. Research emphasizes the need for locally adapted organic seed varieties and breeding programs tailored to organic conditions. Organic seedlings grown without synthetic inputs ensure integrity and perform better due to their resilience [17]–[19]. Limited access to certified seeds hinders organic transitions [20], while locally adapted varieties significantly improve farm performance [18]. Breeding programs are essential for meeting local organic farming needs [9].

Theoretical Framework

The theoretical framework for this study is based on the concept of sustainable agriculture, which integrates ecological, economic, and social dimensions to enhance agricultural productivity while preserving natural resources (Pretty, 2018). It also draws on the sustainable livelihoods framework by Scoones (1998), highlighting the importance of natural resource management, such as water and seed availability, in improving agricultural outcomes and rural livelihoods. Additionally, the resource-based view (RBV) of the firm, as proposed by Barney (1991), is applied to suggest that resources like sustainable practices, water management techniques, and organic seedlings can provide a competitive advantage if they are valuable, rare, and difficult to replicate. In the context of organic farming, access to high-quality resources and effective management strategies can result in superior performance and higher yields.

Organic farming systems influence yields through factors like soil health, biodiversity, and management practices. While initial yields may be lower than conventional systems, long-term benefits such as improved soil health can lead to comparable or superior yields. Studies emphasize biodiversity-enhancing practices and efficient resource management. In South China, organic systems increased beneficial soil probiotics but faced nutrient supply challenges [21]. In the Trans Gangetic plain, natural farming inputs improved soil nitrogen uptake, though yields were slightly lower than integrated nutrient systems [22]. Biodiversity practices like crop rotation and intercropping mitigate weed density, achieving yields similar to conventional methods [23]. In Indonesia, organic rice farmers saw higher net returns despite initial yield gaps due to efficient water management and organic seedlings [24]. Organic farming also improves soil properties, contributing to long-term sustainability [25].

While significant progress has been made in understanding the drivers of productivity in organic farming, there remain several gaps in the literature. First, few studies have focused specifically on the organic farming sector in Indonesia, particularly in regions such as Bandung Regency. Second, the combined effects of sustainable agriculture practices, water management, and organic seedling availability on farm yields have not been extensively explored in the context of organic farms in developing countries. This study seeks to fill these gaps by providing empirical evidence on the factors influencing yields in organic farms in Bandung Regency and offering insights into how these factors can be optimized to enhance agricultural productivity.

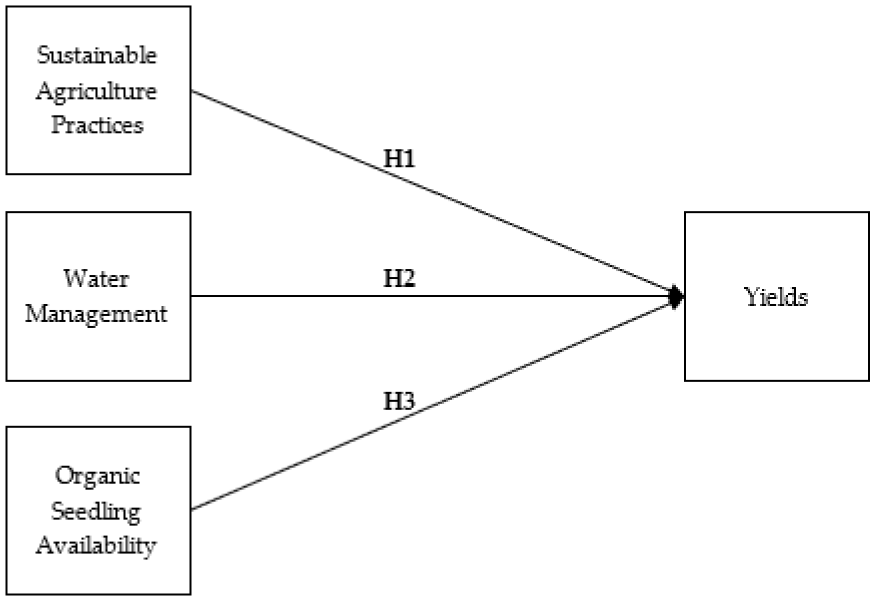

Figure 1. Conceptual Framework

3. METHODS

3.1 Research Design

This research employs a descriptive-explanatory design, aimed at both describing the current state of organic farming in Bandung Regency and explaining the relationships between the variables of interest. A quantitative methodology is chosen to enable the collection and analysis of numerical data that quantify the impacts of sustainable agriculture practices, water management, and organic seedling availability on farm yields. The primary data were gathered through a structured questionnaire, and the analysis was conducted using Structural Equation Modeling (SEM) with Partial Least Squares (PLS) to evaluate the hypothesized relationships.

3.2 Population and Sample

The population for this study consists of organic farmers in Bandung Regency who have adopted sustainable agriculture practices, from which a sample of 230 farmers was selected using purposive sampling. The selection criteria required farmers to have at least two years of organic farming experience, ensuring familiarity with the independent variables under investigation. The sample size, determined based on SEM-PLS analysis guidelines recommending a minimum of 200 participants for reliable results (Hair et al., 2011), is sufficient to represent the region's organic farmers. Data were collected through a structured questionnaire measuring four key variables: sustainable agriculture practices, water management, organic seedling availability, and yields. The questionnaire items were adapted from validated instruments in previous studies, with modifications for the specific context of organic farming in Bandung Regency.

3.3 Data Analysis

The collected data were analyzed using Structural Equation Modeling with Partial Least Squares (SEM-PLS), a robust tool suitable for small to medium-sized samples and complex models with multiple independent variables [26]. SEM-PLS was chosen because it does not require the assumption of normality and can handle multicollinearity between variables. SmartPLS version 3 was used for the analysis, which was conducted in two stages. First, the measurement model assessment evaluated the reliability and validity of the constructs by examining indicator loadings, composite reliability, Cronbach's alpha, and average variance extracted (AVE), with values above 0.7 for indicator loadings and composite reliability, and AVE above 0.5, considered acceptable [27]. Second, the structural model assessment tested the relationships between the independent variables (sustainable agriculture practices, water management, and organic seedling availability) and the dependent variable (yields). Path coefficients, t-values, and p-values were used to determine the significance of the relationships, while the model's explanatory power was assessed using the R-squared (R^2) value and predictive relevance with, where $Q^2 > 0$ indicates predictive relevance [27].

4. RESULTS AND DISCUSSION

4.1 Demographic Profile of Respondents

This section presents the demographic characteristics of the 230 organic farmers who participated in the study, focusing on age, gender, farming experience, farm size, education level, and income. The respondents' ages ranged from 25 to 65 years, with an average of 42.6 years, and the majority fell within the 35-54 age range, indicating a substantial presence of middle-aged farmers. The gender distribution showed that 68.3% were male and 31.7% were female, reflecting a male-dominated trend. Farming experience varied, with most farmers having 6–10 years of organic farming experience, highlighting a relatively mature farming community. The average farm size was 1.5 hectares, with most respondents managing small to medium-sized farms, which may impact the sustainable practices they adopt. In terms of education, 45.7% had completed secondary school, while a smaller percentage had higher education, potentially influencing their access to advanced farming techniques. Regarding income, 41.3% of farmers earned between IDR 50 million and IDR 100 million annually, indicating that a significant portion of farmers fell within the middle-income range.

4.2 Measurement Model Assessment

The measurement model was evaluated to ensure the reliability, internal consistency, and validity of the constructs used in the study. Four main constructs were analyzed: Sustainable Agriculture Practices, Water Management, Organic Seedling Availability, and Yields. Each construct's measurement was tested through indicator loadings, Cronbach's alpha, composite reliability, and average variance extracted (AVE) to confirm the adequacy of the model.

Table 1. Measurement Model

Variable	Code	Loading Factor	Cronbach's Alpha	Composite Reliability	Average Variant Extracted
Sustainable Agriculture Practices	SAP.1	0.720	0.847	0.868	0.568
	SAP.2	0.800			
	SAP.3	0.799			
	SAP.4	0.732			
	SAP.5	0.712			
Water Management	WTM.1	0.739	0.780	0.857	0.600
	WTM.2	0.786			
	WTM.3	0.793			
	WTM.4	0.779			
Organic Seedling Availability	OSA.1	0.781	0.795	0.880	0.711
	OSA.2	0.912			
	OSA.3	0.831			
Yields	YIE.1	0.738	0.871	0.907	0.661
	YIE.2	0.864			
	YIE.3	0.844			
	YIE.4	0.803			
	YIE.5	0.810			

Source: Data Processing Results (2024)

The measurement model assessment confirms strong indicator loadings, high internal consistency, and good convergent validity for all constructs. High Cronbach's alpha and composite reliability values indicate reliable and consistent measurement items. AVE values demonstrate that the constructs explain sufficient variance in their indicators, validating the use of these indicators for measuring the latent variables. Discriminant validity, evaluated using the Fornell-Larcker criterion, is confirmed when the square root of the AVE for each construct exceeds its correlations with other constructs (Fornell & Larcker, 1981).

Table 2. Discriminant Validity

	OSA	SAP	WTM	YIE
Organic Seedling Availability	0.843			
Sustainable Agriculture Practices	0.620	0.754		
Water Management	0.782	0.608	0.774	
Yields	0.743	0.524	0.753	0.813

Source: Data Processing Results (2024)

The diagonal values in the table represent the square root of the AVE for each construct, while the off-diagonal values represent the correlations between the constructs. The square root of the AVE for each construct should be greater than any of the corresponding correlations with other constructs for discriminant validity to hold.

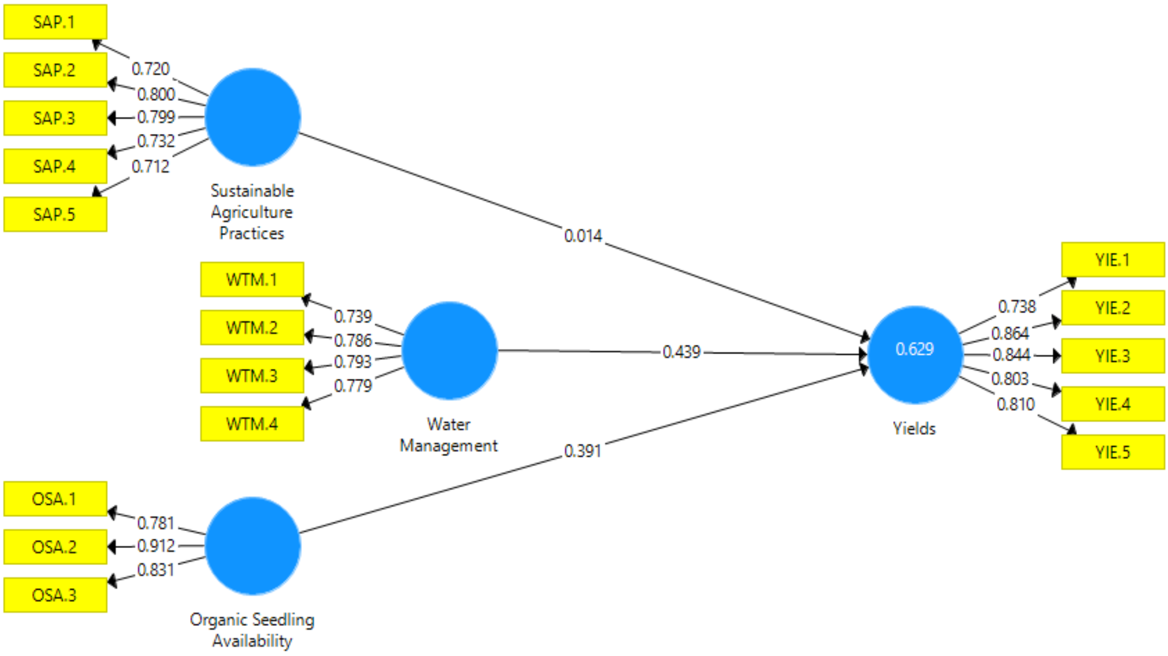

Figure 2. Model Results

Source: Data Processed by Researchers, 2024

4.3 Model Fit Assessment

Evaluating the goodness-of-fit of a model is a crucial step in Structural Equation Modeling (SEM) to ensure that the model adequately represents the data. Several fit indices, including the Standardized Root Mean Square Residual (SRMR), d_ULS, d_G, Chi-Square, and the Normed Fit Index (NFI), are used to assess the overall fit of the model.

Table 3. Model Fit Results Test

	Saturated Model	Estimated Model
SRMR	0.143	0.143
d_ULS	3.149	3.149
d_G	0.970	0.970
Chi-Square	582.260	582.260
NFI	0.621	0.621

Source: Process Data Analysis (2024)

The model fit assessment revealed several areas for improvement. The Standardized Root Mean Square Residual (SRMR) for both the Saturated and Estimated Models was 0.143, exceeding the acceptable threshold of 0.08, indicating a poor fit (Hu & Bentler, 1999). Similarly, the d_ULS value of 3.149 suggests a moderate discrepancy between the observed and predicted covariance matrices, while the d_G value of 0.970 indicates a relatively lower discrepancy, though some misfit persists. The Chi-Square test produced a high value of 582.260, suggesting potential discrepancies in the model, though this test is sensitive to the sample size of 230 (Bollen, 1989). Lastly, the Normed Fit Index (NFI) was 0.621, well below the acceptable threshold of 0.90, indicating that the model may require adjustments, such as adding new paths or refining the structure, to improve fit (Bentler & Bonett, 1980).

Table 4. Coefficient Model

	R Square	Q2
Yields	0.629	0.619

Source: Data Processing Results (2024)

The R-squared (R^2) value of 0.629 indicates that 62.9% of the variance in organic farm yields is explained by the three independent variables: Sustainable Agriculture Practices, Water Management, and Organic Seedling Availability, demonstrating the model's substantial explanatory power. This moderate-to-high R^2 value suggests that the model effectively captures key factors influencing farm productivity, a strong result given the various external factors like weather and soil quality that also impact yields. The Q-squared (Q^2) value of 0.619 further supports the model's predictive relevance, indicating that it can reliably predict yields based on the independent variables. Together, these findings emphasize the importance of sustainable practices, water management, and seed availability in improving organic farm outcomes.

4.4 Hypothesis Testing

This section discusses the results of the hypothesis testing based on the path coefficients, t-statistics, and p-values obtained from the Structural Equation Modeling (SEM) analysis. The aim is to evaluate whether the independent variables (Organic Seedling Availability, Sustainable Agriculture Practices, and Water Management) have a significant effect on the dependent variable (Yields) in organic farms. The hypotheses were tested at a significance level of 0.05.

Table 5. Hypothesis Testing

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics	P Values
Organic Seedling Availability -> Yields	0.391	0.393	0.114	3.440	0.001
Sustainable Agriculture Practices -> Yields	0.314	0.324	0.073	2.986	0.002
Water Management -> Yields	0.439	0.436	0.125	3.521	0.000

Source: Process Data Analysis (2024)

The analysis of path coefficients and their statistical significance reveals that all relationships between the independent variables and yields are positive and significant. The path coefficient between Organic Seedling Availability and Yields is 0.391, with a t-statistic of 3.440 and a p-value of 0.001, confirming a significant positive impact of organic seedlings on yields. Similarly, the relationship between Sustainable Agriculture Practices and Yields has a path coefficient of 0.314, a t-statistic of 2.986, and a p-value of 0.002, indicating a positive effect of sustainable practices on farm productivity. The strongest relationship is observed between Water Management and Yields, with a path coefficient of 0.439, a t-statistic of 3.521, and a p-value of 0.000, highlighting the critical role of water management in enhancing yields. These findings support the hypotheses and align with previous research, emphasizing the importance of organic seedlings, sustainable agriculture, and water management in boosting farm productivity (Lammerts van Bueren et al., 2018; Pretty, 2018; Molden, 2013).

Discussion

The purpose of this study was to investigate the impact of Organic Seedling Availability, Sustainable Agriculture Practices, and Water Management on the Yields of organic farms in Bandung Regency. The findings reveal that all three factors significantly influence yields, providing valuable insights into the key drivers of productivity in organic farming systems. This section discusses the implications of these findings in the context of existing literature, the practical applications for organic farming, and potential areas for future research.

The results show that Organic Seedling Availability has a significant positive impact on yields, with a path coefficient of 0.391 and a t-statistic of 3.440 (p = 0.001), consistent with prior research emphasizing the importance of high-quality organic seedlings for farm productivity [28]–[30]. These seedlings are bred for disease resistance, climate resilience, and adaptability to organic systems, crucial for successful crop growth. However, in Bandung Regency, limited access to certified organic seedlings may reduce productivity, as farmers may resort to conventional seedlings, which are less suited to organic practices. This highlights the need to develop reliable organic seed distribution channels and local seed production initiatives to ensure consistent access to high-quality inputs. Policymakers and agricultural organizations should focus on supporting seed breeding programs, establishing local seed banks, and providing training to educate farmers on the benefits of using certified organic seedlings to enhance farm productivity.

The study confirms that Sustainable Agriculture Practices have a positive and significant effect on yields, with a path coefficient of 0.314 and a t-statistic of 2.986 (p = 0.002), aligning with literature that highlights the benefits of sustainable farming techniques in maintaining soil fertility, promoting biodiversity, and reducing environmental impact [3], [5], [31]. Practices like crop rotation, composting, and natural pest control contribute to improved resilience, lower input costs, and better long-term productivity. The significant impact of these practices on yields underscores their importance in organic farming systems, as they enhance soil health and reduce reliance on chemical inputs. To encourage wider adoption of sustainable practices, agricultural extension services should offer training and resources, while government subsidies or financial incentives could further motivate farmers to integrate these techniques, ensuring both productivity gains and environmental sustainability.

Water Management was found to have the strongest effect on yields, with a path coefficient of 0.439 and a t-statistic of 3.521 (p = 0.000), emphasizing the crucial role of efficient water use in organic farming, especially in regions like Bandung Regency, where water resources may be limited or subject to seasonal fluctuations. Practices such as drip irrigation, mulching, and rainwater harvesting can significantly reduce water wastage and ensure crops receive adequate moisture throughout their growth cycle [32], [33]. This is particularly important in the context of climate change, where irregular rainfall and droughts may become more frequent. Organic farms that adopt efficient water management techniques are better positioned to maintain productivity during water shortages. The strong link between water management and yields highlights this as a critical area for intervention in organic farming. Investments in irrigation infrastructure and water storage, alongside training programs on water conservation techniques, could significantly enhance organic farm productivity, particularly in areas facing increasing water scarcity.

Theoretical Implications

The findings of this study align with the theoretical frameworks of sustainable agriculture and the resource-based view (RBV). According to the Sustainable Livelihoods Framework (Scoones, 1998), managing natural resources like water and seeds is crucial for enhancing farm productivity and sustainability, as evidenced by the positive impact of sustainable agriculture practices and water management on yields. From the RBV perspective (Barney, 1991), organic farms that have access to high-quality organic seedlings, implement sustainable practices, and manage water efficiently gain a competitive advantage through higher yields. These resources are valuable, rare, and difficult to imitate, making them critical to the success of organic farming systems.

Practical Recommendations

Based on the study's findings, several practical recommendations can be made to improve yields in organic farms in Bandung Regency:

1. Policymakers should support the development of local organic seed production and distribution systems. Farmers should be encouraged to use certified organic seedlings, which are more likely to thrive in organic farming systems.
2. Agricultural extension services should provide training on sustainable farming techniques, such as crop rotation, composting, and the use of natural pest control. Incentives such as subsidies or financial assistance could be offered to farmers who adopt these practices.
3. Investments in water-saving technologies, such as drip irrigation and rainwater harvesting, should be prioritized. Farmer training programs that emphasize the importance of water management could lead to improved yields and resilience to water scarcity.

Limitations and Future Research

While this study provides valuable insights into the factors affecting yields in organic farming, there are several limitations to consider. First, the cross-sectional nature of the study limits the ability to infer causality between the variables. Future research could employ a longitudinal design to examine the long-term effects of sustainable practices and water management on yields.

Additionally, the study relies on self-reported data for yields, which may be subject to bias. Future research could incorporate objective yield measurements to provide a more accurate assessment of farm productivity. Finally, the study focuses on organic farms in Bandung Regency, and the results may not be generalizable to other regions with different environmental or socio-economic conditions. Future studies could expand the geographical scope to compare the effects of these factors across different regions.

CONCLUSION

This study concludes that organic seedling availability, sustainable agriculture practices, and water management are significant determinants of yields in organic farms in Bandung Regency. Water management had the most substantial effect on farm productivity, emphasizing the importance of efficient water usage in organic farming systems. The availability of high-quality organic seedlings also proved to be a crucial factor, as did the adoption of sustainable farming techniques. These findings suggest that efforts to enhance organic farming should focus on improving access to organic seedlings, training farmers in sustainable agriculture practices, and promoting water-efficient technologies. Policymakers and agricultural extension services should prioritize these areas to increase productivity and ensure the long-term sustainability of organic farming. Future research should consider longitudinal studies and the exploration of these variables in different regions to validate the results and explore broader implications.

REFERENCES

[1] N. Varma, H. Wadatkar, R. Salve, and T. V. Kumar, "Advancing Sustainable Agriculture: A Comprehensive Review of Organic Farming Practices and Environmental Impact," *J. Exp. Agric. Int.*, vol. 46, no. 7, pp. 695–703, 2024.

[2] V. Harish, A. Mansurali, and D. Krishnaveni, "Digital Transformation for Business: Enablers, Framework and Challenges," in *Transformation for Sustainable Business and Management Practices: Exploring the Spectrum of Industry 5.0*, Emerald Publishing Limited, 2023, pp. 203–218.

[3] M. Huzenko and S. Kononenko, "Sustainable Agriculture: Impact on Public Health and Sustainable Development," *Heal. Econ. Manag. Rev.*, vol. 5, no. 2, pp. 125–150, 2024.

[4] B. Fadila, S. Khaswarina, and Y. Kusumawaty, "THE EFFECT OF MARKETING MIX STRATEGY ON MARKETING PERFORMANCE OF SMALLHOLDER RUBBER FARMERS IN GUNUNG TOAR DISTRICT, KUANTAN SINGINGI REGENCY," *Agric. Socio-Economics J.*, vol. 22, no. 4, pp. 245–253, Oct. 2022, doi: 10.21776/ub.agrise.2022.022.4.1.

[5] N. Kumari, A. K. Pandey, A. K. Singh, and A. Singh, "Sustainable Agriculture: Balancing Productivity and Environmental Stewardship for Future Generations," *J. Sci. Res. Reports*, vol. 30, no. 8, pp. 629–639, 2024.

[6] P. Makinde, "A Comprehensive Review on Transitioning into Organic Farming," *risk*, vol. 3, p. 2, 2024.

[7] P. M. Kusnaedi, C. A. Hartono, S. Kamilah, and E. Ernah, "Etika Permaculture Sebagai Solusi Ilmiah Untuk

Keberlanjutan Lingkungan dan Ekonomi yang Meredakan Kecemasan Petani Organik," *Mimb. Agribisnis J. Pemikir. Masy. Ilm. Berwawasan Agribisnis*, vol. 10, no. 1, pp. 789–796, 2024.
[8] Y. Kamakaula, "Sustainable Agriculture Practices: Economic, Ecological, and Social Approaches to Enhance Farmer Welfare and Environmental Sustainability," *West Sci. Nat. Technol.*, vol. 2, no. 02, pp. 47–54, 2024.
[9] S. Dagar and H. Dagar, "Impact of Organic Farming Practices on Soil Organic Matter: A Review," *Int. J. Plant Soil Sci*, vol. 35, no. 19, pp. 1599–1603, 2023.
[10] R. J. Zendrato, P. H. Telaumbanua, H. P. Zebua, R. V. Nazara, and M. P. Gea, "The IMPLEMENTATION OF ORGANIC FARMING IN REALIZING SUSTAINABLE AGRICULTURE," *J. SAPTA AGRICA*, vol. 3, no. 1, pp. 52–66, 2024.
[11] K. Naganjali *et al.*, "Revamping Water Use in Agriculture: Techniques and Emerging Innovations," *J. Sci. Res. Reports*, vol. 30, no. 7, pp. 1055–1066, 2024.
[12] M. A. Monteiro, Y. T. Bahta, and H. Jordaan, "A Systematic Review on Drivers of Water-Use Behaviour among Agricultural Water Users," *Water*, vol. 16, no. 13, p. 1899, 2024.
[13] M. Rastogi *et al.*, "Advancing Water Conservation Techniques in Agriculture for Sustainable Resource Management: A review," *J. Geogr. Environ. Earth Sci. Int.*, vol. 28, no. 3, pp. 41–53, 2024.
[14] T. Cetinkaya, M. T. Ayseli, and D. Yilmaz, "Sustainable water management in food and agriculture industries: preventive practices, sensory aspects, emerging concerns, and nonthermal strategies," in *Water, the Environment and the Sustainable Development Goals*, Elsevier, 2024, pp. 127–156.
[15] P. Ashoka *et al.*, "Artificial Intelligence in Water Management for Sustainable Farming: A Review," *J. Sci. Res. Reports*, vol. 30, no. 6, pp. 511–525, 2024.
[16] S. Alharbi, A. Felemban, A. Abdelrahim, and M. Al-Dakhil, "Agricultural and Technology-Based Strategies to Improve Water-Use Efficiency in Arid and Semiarid Areas," *Water*, vol. 16, no. 13, p. 1842, 2024.
[17] J. Raj, S. Jat, M. Kumar, and A. Yadav, "The Role of Organic Farming in Sustainable Agriculture," *Adv. Res.*, vol. 25, no. 3, pp. 128–136, 2024.
[18] A. Mahmoud Suleiman, "The Role of Organic Agriculture in Agricultural Development," *Int. J. Mod. Agric. Environ.*, vol. 3, no. 2, pp. 8–16, 2023.
[19] S. Sohail *et al.*, "Organic vegetable farming; a valuable way to ensure sustainability and profitability," *Veg. Crop. benefits Cultiv.*, vol. 101095, 2021.
[20] S. Munné-Bosch and N. F. Bermejo, "Fruit quality in organic and conventional farming: advantages and limitations," *Trends Plant Sci.*, 2024.
[21] Y. Li *et al.*, "Effects of Organic Farming on Soil Probiotics of Double Rice Cropping System in South China," *Am. J. Agric. For.*, vol. 8, no. 3, pp. 232–241, 2024.
[22] S. Darjee *et al.*, "Empirical observation of natural farming inputs on nitrogen uptake, soil health, and crop yield of rice-wheat cropping system in the organically managed Inceptisol of Trans Gangetic plain," *Front. Sustain. Food Syst.*, vol. 8, p. 1324798, 2024.
[23] O. Mwangi, M. Mucheru-Muna, M. Kinyua, P. Bolo, and J. Kihara, "Organic farming practices increase weed density and diversity over conventional practices: a meta-analysis," *Heliyon*, 2024.
[24] R. B. Sanjaya, "Strategi pengembangan pariwisata berbasis masyarakat di Desa Kemetul, Kabupaten Semarang," *Jumpa*, vol. 5, no. 1, pp. 91–110, 2018.
[25] L. T. Indriyati, S. Santoso, and E. Irianti, "Dampak Pertanian Organik dan Konvenional pada Biodiversitas dan Sifat Kimia Tanah pada Budi Daya Tanaman Padi Sawah.," *Indones. J. Agric. Sci. Ilmu Pertan. Indones.*, vol. 29, no. 3, 2024.
[26] W. W. Chin, "The partial least squares approach to structural equation modeling," *Mod. methods Bus. Res.*, vol. 295, no. 2, pp. 295–336, 1998.
[27] J. F. Hair Jr, L. M. Matthews, R. L. Matthews, and M. Sarstedt, "PLS-SEM or CB-SEM: updated guidelines on which method to use," *Int. J. Multivar. Data Anal.*, vol. 1, no. 2, pp. 107–123, 2017.
[28] D. O. Suparwata and F. S. Jamin, "Analysis of Organic Fertilizer Use in Improving Soil Quality and Agricultural Yields in Indonesia," *West Sci. Agro*, vol. 2, no. 01, pp. 17–27, 2024.
[29] I. Permana, M. Suryaman, A. Amilin, D. Zumani, and R. F. Mustofa, "Application of Certified Superior Rice Seed Technology to Increase Organic Rice Production Farmer group in Cipatujah sub-district," *J. Biol. Trop.*, vol. 24, no. 2, pp. 17–25, 2024.
[30] A. Teguh *et al.*, "Mentoring of the True Urban Farming Group in Organic Vegetable Cultivation in RW 04 Bukik Apik Puhun Village Bukittinggi City," *J. Pengabdi. Masy. Biol. EDUKASI DAN Kesehat.*, vol. 1, no. 1, pp. 52–63, 2023.
[31] S. KARADAVUT, S. ERDOGAN, and V. DAYAN, "Investigation of Agricultural Sustainability with Irrigation and Economic Factors," *Black Sea J. Agric.*, pp. 1–2.
[32] A. H. Demo and G. Asefa Bogale, "Enhancing crop yield and conserving soil moisture through mulching practices in dryland agriculture," *Front. Agron.*, vol. 6, p. 1361697, 2024.
[33] C. P. Lakuma, R. Marty, and F. Muhumuza, "Financial inclusion and micro, small, and medium enterprises (MSMEs) growth in Uganda," *J. Innov. Entrep.*, vol. 8, no. 1, Dec. 2019, doi: 10.1186/s13731-019-0110-2.