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Economic Viability and Ecological Outcomes of Organic Horticulture: Evidence from Highland Farming Communities in Bali, Indonesia

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Abstract

Organic horticulture is an essential component of sustainable agriculture, offering agronomic, ecological, economic, and social benefits. This study investigates the economic viability and ecological outcomes of organic horticultural practices among highland farming communities in Bali, Indonesia. Utilizing a case study of certified organic farmer groups, data were collected via interviews, field observations, and secondary sources. Analysis included market trends, cost-benefit ratios, productivity, and environmental indicators. Findings show that organic horticulture enhances soil fertility with compost and manure, and manages pests through crop rotation, intercropping, and plant-derived pesticides. Economically, organic horticulture is highly profitable, with a benefit-cost (B/C) ratio of 14.18, driven by strong consumer demand for pesticide-free produce in urban and tourist markets. Environmentally, organic farming reduces chemical contamination, boosts soil organic matter, and strengthens agroecosystem resilience. Socially, it promotes cooperative farming, knowledge sharing, and community engagement. Challenges include higher input costs, complex certification processes, and limited access to organic farming technology. This research's novelty is its integrative assessment of agronomic productivity, environmental sustainability, and economic feasibility in a unique tropical context, offering a holistic sustainability model. Findings contribute to organic agribusiness theory, sustainable development, and resilient food system policymaking.

Keywords: agroecology, biodiversity conservation, eco-friendly practices, organic agribusiness, smallholder farming, sustainable agriculture

Introduction

Horticulture stands as a cornerstone of sustainable agriculture, playing a critical role in global food security, rural employment, and biodiversity conservation. This sector cultivates a diverse array of plant species, including fruits, vegetables, medicinal herbs, ornamental plants, flowers, and spices, all essential for human consumption, aesthetic value, and various other societal needs.

In Indonesia, demand for horticultural products has been volatile over the past five years. This fluctuation is influenced by factors such as population dynamics, evolving consumption preferences, and shifts in production systems. Data from the 2023 Food Consumption Statistics (Table 1), published by the Ministry of Agriculture, highlights this trend for key commodities, including *Allium fistulosum* (scallions), *Allium cepa* var. *aggregatum* (shallots), and *Amaranthus* spp. (spinach), *Solanum lycopersicum* (tomato), and *Brassica rapa* subsp. *pekinensis* (Chinese cabbage) (Statistics Indonesia, 2024).

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Organic horticulture, defined as the cultivation of crops without synthetic fertilizers or chemical pesticides, has attracted increasing global attention for its perceived health and environmental benefits (Nuddin et al., 2021). The core principles of organic farming emphasize maintaining soil fertility, enhancing plant health, and promoting ecological balance. This is achieved through practices such as composting, the application of natural manures, the use of botanical pesticides, and the integration of agroecological techniques like crop rotation, mulching, and the strategic use of beneficial insects.

Driven by rising consumer awareness of food safety, environmental sustainability, and overall wellness, demand for organic horticultural produce has expanded significantly globally and domestically (Garcia et al., 2020). Consumers increasingly favor organic crops as safer alternatives, free of chemical residues, aligning with desires for healthier, environmentally responsible diets. The adoption of plant-based and organic dietary patterns has become more prevalent, supported by a growing interest in traceability and certification systems that guarantee adherence to stringent organic standards (Mayrowani, 2016; Prasarana & Harsono, 2017; Rosanti et al., 2020).

Within Indonesia, the Indonesian Organic Alliance (AOI) regularly reports on the development of organic agriculture. While precise market demand figures remain largely undocumented, the observed increase in land area dedicated to organic cultivation and the rising number of certified organic farmers strongly indicate a burgeoning market for organic produce.

Despite this growing interest and clear market potential, organic horticulture faces substantial challenges. These include the higher costs associated with organic inputs, limited access to effective organic crop protection methods, a prevalent shortage of technical knowledge among farmers, and complex, often expensive, certification procedures. Smallholder farmers encounter significant financial and logistical hurdles during the transition from conventional to organic farming systems. Furthermore, underdeveloped distribution infrastructure, coupled with the typically higher market prices of organic products, restricts consumer access in many regions. Environmental stressors, notably erratic weather patterns exacerbated by climate change, also pose considerable risks to organic crop yields (Islam et al., 2017; Pampuro et al., 2020; Romadhona et al., 2024).

These interconnected constraints contribute to a persistent gap between the rising demand for organic horticultural products and the current supply capacity. Although consumer interest continues to grow, production remains insufficient due to slow conversion rates, market inefficiencies, and institutional limitations. Addressing these barriers necessitates coordinated support from policymakers, academic institutions, and the private sector. Key interventions must include capacity building for organic farmers, tailored

Table 1

Annual Production of Selected Horticultural Commodities in Indonesia (2019–2023)

Horticultural commodities	Number of production per year				
	2019	2020	2021	2022	2023
Scallions/ welsh onion	5,905,956	5,797,478	6,278,531	6,387,345	6,396,754
Shallots / onion	15,802,428	18,154,453	20,045,904	19,823,602	19,852,333
Spinach	1,603,059	1,570,242	1,717,057	1,708,214	1,706,876
Tomato	10,203,308	10,849,934	11,143,995	11,687,437	11,437,877
Chinese cabbage/ petsai	6,527,228	6,674,730	7,274,670	7,606,082	6,868,757

Source. Statistics Indonesia, 2024.

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financial incentives, improved access to organic inputs and technologies, streamlined certification processes, and enhanced logistics and distribution systems.

This study investigates the economic viability and ecological outcomes of organic horticulture within the context of highland farming communities in Bali, Indonesia. Specifically, it assesses agronomic productivity, pest and disease management strategies, the efficacy of organic fertilizer use, market feasibility, and the overall environmental impact within this unique local context. By integrating these diverse dimensions, this research offers valuable contributions to agribusiness theory, to understanding organic market behavior, to informing sustainable policy formulation, and to guiding the development of appropriate agricultural technologies.

The novelty of this research lies in its holistic sustainability assessment model. Unlike prior studies that often focus narrowly on either economic returns or environmental performance, this research provides an integrated analysis. This comprehensive approach is particularly pertinent for ecologically and culturally distinct regions such as Bali. The findings offer strategic insights for designing sustainable, resilient, and economically viable organic horticulture systems that are aligned with global food security and climate adaptation objectives.

Materials and Methods

This study was conducted in 2025 at the Gumi Alami Organic Farm, a certified organic farm situated in the highlands of Bali, Indonesia. The Gumi Alami Organic Farm has been implementing an organic farm since 2018. The research adopted a case study approach, focusing on farmer groups actively engaged in organic horticultural production and affiliated with a local organic farming association. This method allowed for an in-depth examination of the specific economic and ecological dynamics within a single, well-defined community of practice.

Primary data were systematically collected through a combination of structured interviews, direct field observations, and surveys involving key stakeholders. These participants included organic farmers, marketing agents, and representatives from local cooperative organizations. This primary data was supplemented with secondary data from relevant institutional reports, statistical publications, and official government records, providing a broader context for the farm-level findings. The research was designed to assess a comprehensive range of factors, including agronomic practices, market dynamics, input efficiency, and environmental impacts.

A mixed-methods analytical framework was employed to integrate both qualitative and quantitative data. The quantitative analysis involved several key components. A market analysis was conducted to evaluate the demand and supply dynamics for organic horticultural products from Gumi Alami Organic Farm. Price elasticity of demand (E_d) and price elasticity of supply (E_s) were calculated to measure the responsiveness of quantity demanded and quantity supplied to price changes, respectively. Supply analysis followed a similar elasticity-based approach to assessing the responsiveness of product offerings to price fluctuations. The formulas used were:

$$E_d = \frac{Percentage\ change\ in\ the\ number\ of\ requests\ for\ Organic\ Horticultural\ Products}{Percentage\ Change\ in\ the\ price\ of\ Organic\ Horticultural\ Products} = \frac{\Delta Q/Q}{\Delta P/P}$$

Where:

ΔQ	=	Change in the quantity demanded for organic horticultural products
Q	=	Initial quality demanded of organic horticultural products
ΔP	=	Change in the price of organic horticultural products
P	=	Initial price of organic horticultural products

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$$E_s = \frac{Percentage\ change\ in\ the\ number\ of\ Organic\ Horticultural\ Product\ Offerings}{Percentage\ Change\ in\ price} = \frac{\Delta S/S}{\Delta P/P}$$

Where:
E_s = Elasticity of supply
ΔS = Change in the number of offers of organic horticultural products
Q = Number of initial offers for organic horticultural products
ΔP = Change in price of organic horticultural products
P = Initial price of organic horticultural products

Marketing efficiency was evaluated through a marketing margin analysis, calculated using the formula:

$$\mathrm{M} = P_r - P_f$$

Where:
M = Marketing margin
P_r = Retail price of organic horticultural products
P_f = Farm-gate price received by producers

To understand the distribution of value, the farmer's share (FS) of the final consumer price was determined using the formula:

$$\mathrm{FS} = \frac{Pf}{Pr} x\ 100\%$$

This metric quantifies the percentage of the final consumer price that accrues to the farmer. The financial viability of the organic farming operations was assessed using the benefit/cost (B/C) ratio, calculated as:

$$\mathrm{B/C} = \frac{Total\ Revenue}{Total\ Cost} = TR/TC$$

A ratio greater than 1.0 was considered indicative of economic profitability.

The study also included a productivity analysis, in which the output of horticultural commodities was quantified as the total harvest per cultivated area. Crop selection for this analysis was based on agro-climatic suitability and the use of protective technologies, such as greenhouses, to enhance yields.

$$\mathrm{Productivity} = \frac{Harvest\ Volume\ (kg)}{Cultivated\ Area\ (ha)}$$

This was followed by a technological efficiency evaluation, which compared organic farming systems with conventional practices. The key indicators for this evaluation were a reduction in water consumption, decreased reliance on synthetic fertilizers, and improved yield performance under organic protocols, all of which were measured through comparative field observations and farmer-reported metrics. Environmental sustainability was assessed by tracking key indicators, including reductions in chemical inputs, the use of organic fertilizers, and the implementation of conservation practices such as crop rotation and mulching. Particular attention was given to the effectiveness of natural resource conservation strategies, especially water management, which is critical for long-term ecosystem sustainability. Finally, future revenue projections were conducted using linear regression models based on historical production and income data to simulate and estimate trends in the profitability of the organic horticultural systems.

Results and Discussion

Ecological Practices and Input Sourcing at Gumi Alami Organic Farm

The Gumi Alami Organic Farm, dedicated to high-value organic horticulture, cultivates a diverse range of market-ready commodities, including *Daucus carota* (carrot), *Amaranthus* spp. (spinach), and *Brassica oleracea* var. *italica* (broccoli). Consistent adherence to certified organic standards ensures the complete exclusion of all synthetic chemical fertilizers and pesticides.

Soil fertility is the core management priority and is meticulously maintained through

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the internal sourcing and application of organic amendments. Key inputs include compost derived from free-range chicken manure produced by the farmers, vegetable waste, and locally collected dry leaves. This practice significantly enhances nutrient content and bolsters soil organic matter, both of which are vital for maintaining long-term soil health (Bergstrand, 2022).

Pest, weed, and disease management is achieved through integrated ecological controls. Weed management utilizes developed biological controls that incorporate living organisms (Cai & Gu, 2016). For specific pest and disease suppression, farmers use locally sourced natural repellents, notably extracts from neem (*Azadirachta indica*) and garlic (*Allium sativum*) leaves, combined with regular sanitation measures, such as prompt removal of infected plant parts. The strategic choice to utilize these self-produced organic materials is primarily driven by their low cost, localized availability, and contribution to greater independence in farm operations, aligning with broader sustainable horticultural management recommendations (Feldmann & Vogler, 2021). Furthermore, the farm uses non-contaminated water sources (springs and clean wells) that are consistently monitored to meet organic farming requirements for pH and chemical safety (Csambalik et al., 2023).

Market Demand and Consumer Demand

Analysis of the five-month market period (February to June 2025) reveals a stable monthly average demand of 413 kg for organic vegetables sourced from the Gumi Alami Organic Farm (Figure 1). This consistent purchasing behavior suggests that Balinese consumers increasingly view organic produce as a routine dietary necessity rather than a luxury commodity (Hoesain et al., 2022; Mayrowani, 2016; Ramadini et al., 2014). Consumer preference is concentrated on staple items, with the highest recorded demand for potatoes (*Solanum tuberosum*), carrots (*Daucus carota*), and cauliflower (*Brassica oleracea* var. *botrytis*) (Figure 1).

The overall market for organic horticultural products in Bali has demonstrated a consistent upward trajectory, propelled mainly by heightened public awareness regarding health and environmental sustainability (Figure 2). This trend accelerated dramatically during the COVID-19 pandemic, where urban and peri-urban demand surged by up to 300% and necessitated a significant shift toward digital purchasing platforms (Dorais & Cull, 2017; Estrada et al., 2023). According to the 2023 Indonesian Organic Agriculture Statistics (SPOI), this growth extends beyond fresh produce to processed organic goods, including cosmetics and health supplements.

The post-pandemic recovery of the tourism sector has further amplified demand (Figure 2), particularly in high-traffic tourist areas such as Ubud, Kuta, and Badung. However, current local organic production is insufficient to meet this elevated consumer and institutional demand, requiring imports from larger horticultural centers in Java. Efforts to establish Bali as an “Organic Island” are challenged by limited public understanding of the organic certification process and consumers’ reluctance to accept the associated price premiums. Despite these obstacles, the underlying demand for pesticide-free commodities remains robust.

Pest and Disease Management in Organic Horticulture

Organic horticulture necessitates an Integrated Pest and Disease Management (IPDM) approach that emphasizes ecological balance, crop diversity, and proactive preventive strategies (Ma et al., 2021; Tybirk et al., 2004). Preventive measures include selecting suitable sites, rigorous sanitation to eliminate pest hosts, and implementing diverse crop rotation sequences using botanically unrelated plant families (Parke & Grünwald, 2012).

Farm-level ecological controls leverage resistant cultivars, sanitized tools, and specific plant arrangements. For instance, border crops (e.g., celery) are used to protect the cultivated area from external contamination. In contrast,

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trap crops (e.g., marigolds, corn) divert primary insect pests by serving as preferred hosts, thereby facilitating targeted population suppression. Furthermore, consistent compost application promotes soil microbial diversity, which is crucial for natural pathogen suppression.

When pest pressure increases, mechanical controls (e.g., manual removal) and botanical insecticides are employed. However, the exclusion of synthetic fungicides means

Figure 1

Average Monthly Demand (kg) for Selected Organic Horticultural Commodities in Bali, Indonesia (February–June 2025), Illustrating Consumer Preferences and Market Trends Across Diverse Vegetable Types

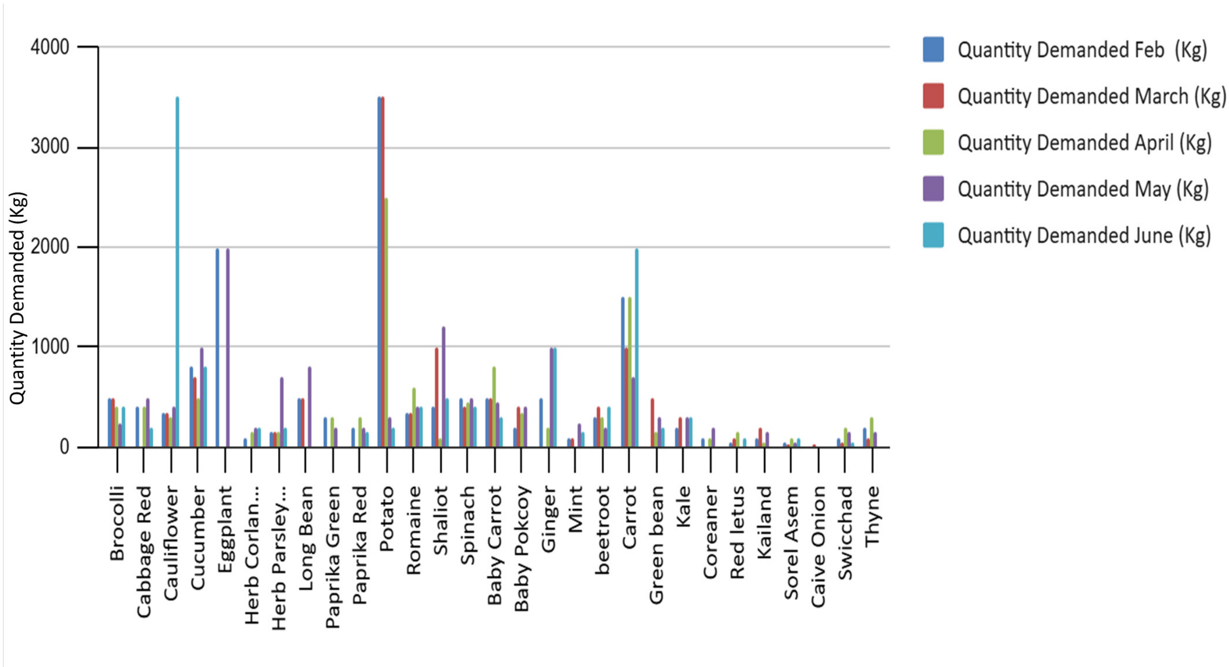
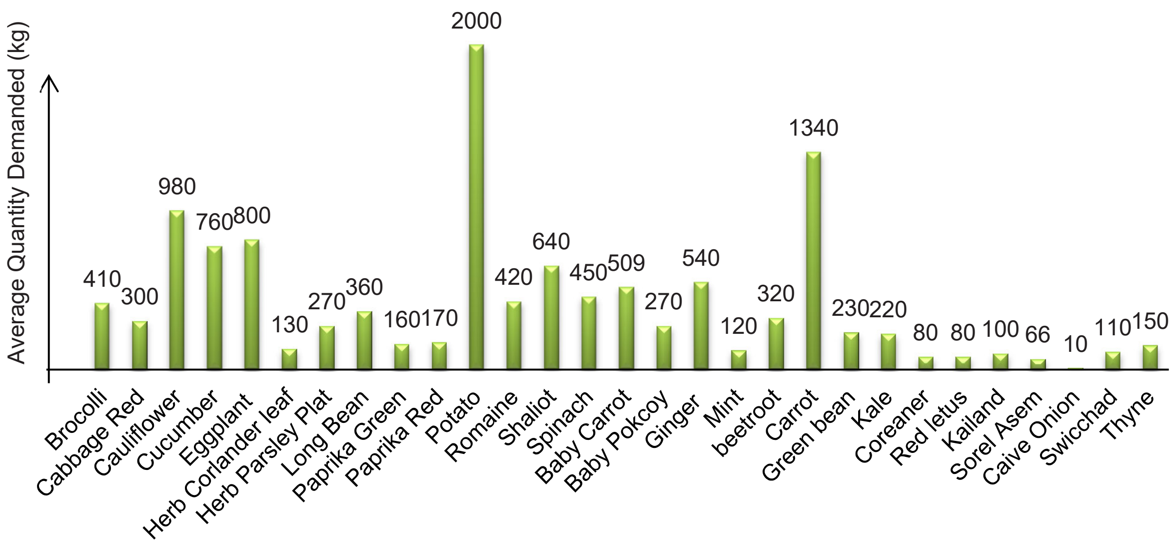


Figure 2

Market Dynamics for Organic Horticultural Products in Bali Highland Communities, 2025, Indonesia



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that common fungal pathogens (e.g., *Fusarium*, powdery and downy mildew) and bacterial pathogens (*Xanthomonas*, *Pseudomonas*) pose persistent challenges. Viruses, notably tomato yellow leaf curl virus and cucumber mosaic virus, also inflict significant crop damage. The effective management of these threats hinges on integrating resistant varieties and ecological controls (Barzman et al., 2015). Maintaining optimal soil health is essential; nutrient deficiencies or degradation directly compromise plant resilience and systemic disease prevention, underscoring the fundamental role of organic practices in building long-term system resilience.

Economic Viability of Organic Horticulture

An economic analysis of the Gumi Alami Organic Farm demonstrates substantial profitability within organic horticulture. The average monthly income for farmers operating on a cultivated area of 0.41 ha is IDR 24,211,900 (equivalent to USD 1,460.90). This significant profitability stems primarily from the premium market valuation of organic products, particularly within Bali's high-value tourist zones, including Ubud, Seminyak, and Kuta. The primary customer base consists of health-conscious expatriate residents and domestic consumers with elevated purchasing power who are willing to absorb these price premiums.

Although organic yields are generally lower than those observed in conventional systems, typically falling by approximately 10%–32% (Lesur-Dumoulin et al., 2017), this reduction is effectively offset. Compensation is driven by two key factors: significantly reduced external input costs and higher selling prices for certified organic produce. Furthermore, operational maintenance costs are comparatively lower due to reliance on locally available resources and the inherent efficiency of ecological farming practices.

Feasibility Analysis of Farming Business Using the Benefit-Cost (B/C) Ratio Approach

The financial viability and profitability of the organic horticulture enterprise were rigorously assessed using the benefit-cost (B/C) ratio approach. Based on a detailed analysis, the farm generated total revenue of IDR 24,211,931, while total costs incurred were IDR 1,594,925.14. This resulted in a net benefit of IDR 22,617,006. The B/C ratio was calculated as follows:

$$\mathrm{B/C\ ratio} = \frac{Organic\ Horticulture\ Revenue}{Organic\ Horticulture\ Cost} = \frac{24{,}211{,}931}{1{,}594{,}925.14} = 14.18$$

According to standard economic feasibility criteria, an enterprise with a B/C ratio greater than 1.0 is considered financially viable. The resulting B/C ratio of 14.18 for organic horticultural production at the Gumi Alami Organic Farm is exceptionally high, indicating that the organic farming operation is not only viable but also highly efficient and profitable. This outcome demonstrates that for every unit of cost invested, the business generates 14.18 units of benefit. This finding provides a critical foundation for investment decision-making, particularly for the development of farming enterprises focused on high-value local commodities. The high B/C ratio reflects optimal resource allocation efficiency and presents a significant opportunity for sustainable business scaling up. Consequently, these results recommend replicating and expanding similar business models in other regions with comparable agro-ecological conditions, especially when strategically aligned with niche markets and strong tourism-driven demand.

Environmental Impact on Organic Horticulture Production

The green revolution, while successfully addressing global food needs through the widespread adoption of synthetic chemical fertilizers, high-yield varieties, and pesticides, simultaneously introduced significant adverse environmental and human health consequences. In Indonesia, agricultural land shows declining productivity; as early as 2004, the Department of Agriculture noted that farmers complained that higher fertilizer doses no longer increased crop production. Continuous and escalating application of synthetic chemicals demonstrably degrades the soil's biological and

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physicochemical properties, exacerbating soil degradation. Furthermore, the development of pathogen immunity is well documented and associated with long-term pesticide application (R4P (Reflection and Research on Resistance to Pesticides) Network, 2016). This observed decline in agricultural land productivity and environmental damage has spurred the development of organic farming as a viable alternative capable of producing contamination-free products while maintaining a healthier environment.

This approach is legally supported by Indonesian Government Regulation No. 6/1995 Article 4, which mandates plant protection methods that do not harm human health or threaten natural resources, and by Minister of Agriculture Regulation No. 64/Permentan/OT.140/5/2013 on organic farming systems, which defines organic farming as a holistic production management system enhancing agro ecosystem health, biodiversity, biological cycles, and soil biological activity. This system emphasizes management practices that prioritize the utilization of internal waste and locally adapted external inputs, employing agronomic, biological, and mechanical methods rather than synthetic materials (Apritanto et al., 2024). Ultimately, organic farming strives to emulate natural processes that improve soil and plant health while conserving soil and water resources (Gomiero et al., 2011). Maintaining soil quality and health remains the cornerstone of the organic farming movement.

Organic farming practices offer substantial positive contributions to environmental sustainability. By avoiding synthetic inputs, they significantly reduce chemical runoff into soil and water bodies, thereby improving soil structure and enhancing biodiversity (Aulakh et al., 2022; Gomiero et al., 2011). The consistent application of compost and other organic fertilizers increases cation exchange capacity and soil organic carbon content, thereby supporting beneficial microbial activity and improving overall soil fertility (Tong et al., 2022). In contrast, intensive tillage, excessive application of pesticides and chemical fertilizers, and monoculture farming negatively impact soil microbial life, disrupting essential soil ecosystem functions and diminishing soil productivity (Gouda et al., 2017; Louw et al., 2025).

The environmental impact of organic horticultural production is multifaceted, encompassing both significant positive and some potential negative aspects. Organic horticulture fosters ecosystem balance by minimizing reliance on pesticides and synthetic chemicals, which are detrimental to local flora and fauna, thereby helping maintain a crucial balance within the ecosystem (FiBL, 2024; Huber et al., 2011), by exclusively using natural fertilizers and adopting more environmentally friendly cultivation techniques, organic farming substantially reduces the contamination of soil and water bodies by harmful chemicals. The continuous use of compost and other organic fertilizers demonstrably improves soil structure, increases organic matter content, and enhances soil moisture retention, thereby reducing soil erosion and contributing to higher long-term crop yields. Furthermore, organic farming methods often rely less on energy-intensive heavy machinery and chemical production, thereby reducing greenhouse gas emissions.

Despite these benefits, organic systems present some challenges. Organic systems may require greater land use per unit of yield than conventional farming, raising concerns about land-use efficiency (Connor, 2022; Tuomisto et al., 2012), which could lead to land conversion or deforestation if not managed carefully. Some organic farming methods, particularly those employing traditional irrigation and mulching techniques, may require greater water use than conventional systems that use highly efficient irrigation technologies. More complicated pest management arises from the limited range of control options for pests and diseases, coupled with potentially greater labor demands for manual pest management (Gutiérrez García et al., 2020; McRoberts et al., 2003). Lastly, improper management of fertilizer materials, such as animal manure, can lead to environmental contamination if not managed responsibly and sustainably. Despite these limitations, organic systems generally contribute

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to reduced greenhouse gas emissions, improved ecosystem resilience, and the maintenance of agroecological balance. These significant environmental advantages, when combined with appropriate technological adoption and robust farmer training programs, strongly support long-term sustainability goals in agriculture.

The improved environmental conditions at Gumi Alami Organic Farm are reflected in healthier soil, maintained air quality, increased biodiversity, a greener, more stable landscape, and reduced pollution. All of these indicators demonstrate that organic farming is not just about producing healthy vegetables, but also about building a sustainable agricultural ecosystem. Biodiversity at Gumi Alami Organic Farm includes diverse crops (polyculture), pollinating insects and natural enemies, small animals, soil microorganisms, and agroecological landscapes that support life.

Market Demand Elasticity Pricing Strategy

Analysis of the Gumi Alami Organic Farm market revealed significant variations in consumer price sensitivity across commodities, as detailed in Table 2. The calculated price elasticity of demand (E_d) determines optimal pricing strategies. In this analysis, the magnitude (E_d) is used for interpretation; the negative sign merely reflects the inverse relationship between price and quantity demanded (the law of demand).

Inelastic demand ($E_d < 1$): Commodities such as broccoli (-0.60), red paprika (-0.75), spinach (-0.60), romaine lettuce (0.43), and shallot (0.75) exhibit inelastic demand, indicating they are perceived as necessary goods with few immediate substitutes. For these items, a price increase would lead to a proportionally smaller decrease in demand, allowing producers to raise prices slightly to maximize total revenue. Cucumber (0.00) and thyne (0.00) exhibit perfectly inelastic demand, indicating that consumer demand is entirely unresponsive to price changes.

Unitary elasticity ($E_d = 1$): products with unitary elasticity, such as parsley plat (1.00), beetroot (1.00), and carrot (1.00), require a focus on maintaining stable prices and consistent supply, as price changes result in an equal percentage change in demand, maintaining total revenue stability.

Elastic demand ($E_d > 1$): consumers are susceptible to price changes for commodities such as mint (1.50), kale (1.50), coriander leaf (3.00), ginger (3.00), red lettuce (3.00), and cauliflower (27.00). The extremely high elasticity of cauliflower (27.00) suggests a low initial price and high substitutability. Several other commodities, including eggplant, long bean, green paprika, potato, baby pak choy, and kailan, also exhibit high elasticity (around -3.00). For all elastic products, the optimal strategy is to maintain stable or slightly lower prices to maximize sales volume and total revenue.

This analysis further indicates that the farm employs a fixed markup pricing strategy, resulting in consistent margins across most commodities. The average price increase across the 29 observed commodities was 33.33%, yielding a total margin of IDR 529,650 (initial price: IDR 1,588,950; final price: IDR 2,118,600). While this fixed markup simplifies pricing and ensures stable profits, it fails to account for the differential price sensitivity identified by the elasticity analysis (Table 2). To optimize revenue, the fixed-margin approach should be dynamically adjusted based on commodity-specific demand elasticity and market conditions, including seasonal factors, stock availability, and consumer demand.

Economic Viability: Marketing Margin and Pricing Strategy

The economic viability analysis of the horticultural supply chain revealed a consistent and significant marketing margin across the 29 observed commodities. The total initial purchase price recorded from farmers was IDR 1,588,950, while the aggregate final consumer price reached IDR 2,118,600. This yielded a total marketing margin of IDR 529,650, which translates to an average price increase of 33.33% over the initial purchase price for each commodity.

This highly consistent margin, as detailed

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in Table 3, strongly indicates the application of a fixed markup pricing strategy by supply chain actors, such as farmer groups and cooperatives. Under this system, the selling price is determined by adding a standardized one-third of the initial purchase cost, effectively simplifying pricing management and ensuring a stable, sustainable profit foundation. For example, a commodity purchased from the farmer at IDR 63,000/kg (e.g., broccoli) is sold to the consumer at IDR 84,000/kg, securing a fixed margin of IDR 21,000 (33.33%).

Table 2

Elasticity of Demand for Organic Horticultural Commodities at Gumi Alami Organic Farm

No.	Commodity	Elasticity of demand (Ed)	Interpretation
1	Broccoli	-0.60	Inelastic
2	Red cabbage	-1.50	Inelastic
3	Cauliflower	27.00	Elastic
4	Cucumber	0.00	Perfectly inelastic/unitary elasticity*
5	Eggplant	-3.00	Inelastic
6	Herb coriander leaf	3.00	Elastic
7	Herb flat parsley	1.00	Elastic/unitary elasticity
8	Long bean	-3.00	Inelastic
9	Green paprika	-3.00	Inelastic
10	Red paprika	-0.75	Inelastic
11	Potato	-2.83	Inelastic
12	Romaine	0.43	Elastic
13	Shallot	0.75	Elastic
14	Spinach	-0.60	Inelastic
15	Baby carrot	-1.20	Inelastic
16	Baby bok choy	-3.00	Inelastic
17	Ginger	3.00	Elastic
18	Mint	1.50	Elastic
19	Beetroot	1.00	Elastic/unitary elasticity
20	Carrot	1.00	Elastic/unitary elasticity
21	Green bean	3.00	Elastic
22	Kale	1.50	Elastic
23	Coriander (seed/whole)	-3.00	Inelastic
24	Red lettuce	3.00	Elastic
25	Chinese kale (kailan)	-3.00	Inelastic
26	Sorrel (asem)	3.00	Elastic
27	Chive onion	-3.00	Inelastic
28	Swiss chard (switched)	-1.50	Inelastic
29	Thyme	0.00	Perfectly inelastic / unitary elasticity*
	Amount	19.20	
	Average	0.662	

Source. Analyzed from primary data, 2025.

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Market Dynamics and Pricing Optimization

While the observed pricing pattern reflects an apparent efficiency, providing proportional added value relative to initial cost, its reliance on a rigid fixed margin presents a limitation. Horticultural commodity prices are inherently volatile, influenced heavily by seasonal factors, stock availability, and dynamic consumer demand.

To maximize economic performance, the fixed margin model should be strategically

Table 3

Marketing Margin Analysis of Organic Horticultural Commodities

No.	Commodity	Final price (IDR)	Producer / original price (IDR)	Marketing margin (IDR)
1	Broccoli	84,000	63,000	21,000
2	Red cabbage	45,000	33,750	11,250
3	Cauliflower	50,000	37,500	12,500
4	Cucumber	30,000	22,500	7,500
5	Eggplant	35,000	26,250	8,750
6	Herb coriander leaf	100,000	75,000	25,000
7	Herb flat parsley	150,000	112,500	37,500
8	Long bean	65,000	48,750	16,250
9	Green paprika	90,000	67,500	22,500
10	Red paprika	170,000	127,500	42,500
11	Potato	56,000	42,000	14,000
12	Romaine	52,000	39,000	13,000
13	Shallot	96,000	72,000	24,000
14	Spinach	95,000	71,250	23,750
15	Baby carrot	28,000	21,000	7,000
16	Baby bok choy	66,800	50,100	16,700
17	Ginger	34,000	25,500	8,500
18	Mint	97,000	72,750	24,250
19	Beetroot	82,000	61,500	20,500
20	Carrot	28,000	21,000	7,000
21	Green bean	60,000	45,000	15,000
22	Kale	60,000	45,000	15,000
23	Coriander	40,000	30,000	10,000
24	Red lettuce	60,000	45,000	15,000
25	Chinese kale (kailan)	52,000	39,000	13,000
26	Sorrel (asem)	70,000	52,500	17,500
27	Chive onion	150,000	112,500	37,500
28	Swiss chard	52,800	39,600	13,200
29	Thyme	120,000	90,000	30,000
Totals/averages	Amount (total)	2,118,600	1,588,950	529,650
	Average	73,055.17	54,791.38	18,263.79

Source. Analyzed from primary data, 2025.

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adapted. High-value, scarce commodities—such as red paprika (IDR 170,000 final price) and fresh herbs like flat parsley (IDR 150,000 final price)—have greater potential selling value in modern markets. A more sophisticated, demand-driven pricing strategy for such items would allow supply chain actors to realize greater profit potential beyond the standard 33.33% markup.

Ultimately, the marketing and distribution system has successfully generated significant economic added value for both farmers and supply chain participants. The average 33.33% margin provides a strong foundation for stable and sustainable business operations, provided it is supported by three critical elements: effective supply chain management, rigorous product quality control, and efficient logistics. This sustainable profitability is key to encouraging the continued adoption and scaling of organic horticultural practices in the Bali highlands.

Farmer's Share

Farmer's share is an important indicator to assess the extent to which farmers benefit economically from the sale of their products. It represents the percentage of the final consumer price that farmers receive. The higher the percentage, the larger the share of revenue farmers receive in the product's value chain.

Based on the calculations, the farmer's share for horticultural commodities is approximately 75% on average. This means that for every IDR 100,000 of the consumer's purchase price, farmers receive IDR 75,000, while the remaining IDR 25,000 covers distribution, transportation, packaging costs, and trader or retailer margins.

A farmer's share of 75% indicates that the marketing system for these commodities is efficient. Farmers obtain a significant portion of the final price, while marketing margins remain relatively small. This situation typically occurs in short distribution chains, such as when farmers sell directly to consumers or to modern markets with few intermediaries.

From an economic standpoint, a high farmer's share reflects strong farmer bargaining power and a significant contribution to product value formation. It also indicates that distribution and marketing costs are not excessively high, preventing profit erosion through extended supply chains. In the long term, such conditions can increase farmer income and welfare, while strengthening the independence of local production and marketing systems.

Conversely, when the farmer's share is low, farmers receive only a small fraction of the selling price. At the same time, a larger portion of the added value is captured by traders or intermediaries. Therefore, maintaining or increasing farmers' share is a key strategy in developing a sustainable horticultural agribusiness.

Conclusions

This study conclusively demonstrates that organic horticulture in Bali's highland farming communities offers substantial and interconnected benefits across agronomic, environmental, and economic dimensions. Agronomically, the consistent application of organic fertilizers, including compost, manure, and organic mulch, significantly enhances soil organic matter content, improves soil structure, and increases cation exchange capacity. While these organic systems may exhibit comparatively lower initial productivity than conventional methods, they yield profound long-term advantages in superior crop quality and robust agroecosystem resilience.

Ecologically, the complete exclusion of synthetic fertilizers and pesticides markedly reduces the risk of soil and water contamination. This shift to sustainable land use, characterized by the integration of organic materials, fortifies soil structure and is critical for enhancing the long-term health and stability of the agroecosystem. Economically, the findings confirm that organic horticulture in the Balinese highlands is demonstrably viable and highly profitable. This strong financial performance is unequivocally affirmed by a calculated benefit-cost (B/C) ratio of 14.18. Profitability is primarily driven by continuously increasing demand for

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organic products, particularly within Bali's vibrant urban and tourist markets, enabling farmers to command premium prices and secure improved livelihoods and economic stability. This integrated evidence underscores that organic horticulture is a financially compelling and environmentally superior model for fostering resilient and sustainable agricultural development in similar tropical highland regions.

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