

# Cultivating Economic Value: How Productive Waqf and Greenhouse Technology Drive Local Development

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**Abstract.** The agricultural sector in many Muslim-majority developing countries is often hindered by limited capital and technological stagnation. This study aims to examine how the integration of productive waqf (Islamic social finance) and greenhouse technology can serve as a catalyst for local economic development. Design/methodology/approach: Adopting an inductive qualitative approach, this research utilizes a case study of the Premium Melon Waqf Greenhouse Cluster in Gunung Kidul, Indonesia. Data were collected through in-depth interviews, field observations, and document analysis, and were analyzed to identify economic impacts and operational strategies. Findings: The results indicate that the synergy between cash waqf and modern greenhouse technology creates a high-impact economic ecosystem. The program successfully transformed unproductive land into a high-yield asset producing 35–40 tons of premium melons annually per hectare. Financially, the project projects a break-even point within 2.5 years with substantial returns for investors. Socially, it creates a multiplier effect by raising local wages by 142.42% compared to conventional farming and fostering skill development.

## 1 Introduction

Achieving sustainable economic development remains a formidable challenge for developing nations, which are often beset by stark economic disparities, food security vulnerabilities, and the escalating impacts of climate change. These issues demand urgent and holistic interventions. In many Muslim-majority countries, the agricultural sector is a cornerstone of the national economy; however, its potential is frequently stifled by inadequate access to modern technology and insufficient financial support [1]. Indonesia's recent economic performance reflects these uncertainties, with Gross Domestic Product (GDP) growth experiencing slight deceleration, from 5.05% in 2023 to 5.03% in 2024. This trajectory highlights the critical need to align national strategies with the Sustainable Development Goals (SDGs), specifically SDG 1 (No Poverty), SDG 2 (Zero

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Hunger), and SDG 8 (Decent Work and Economic Growth), by prioritizing innovation and sustainable investment in strategic sectors [2].

Agricultural innovation is essential for improving community welfare, particularly for the farming population that Indonesia relies upon as the backbone of its economy [3]. Despite its importance, current growth in agricultural production is failing to keep pace with the food requirements of a global population projected to reach 9.6 billion by 2050. A significant bottleneck in Indonesia's agricultural development is the precarious state of smallholder farmers, who are often constrained by high land rental costs and a lack of operational capital. Statistics Indonesia (BPS) reports that approximately 29 million Indonesians live below the poverty line, with a staggering 18 million concentrated in rural areas, underscoring the urgent need for structural support [3].

The concept of productive waqf offers a viable solution to these structural deficits. By shifting the paradigm from traditional, consumptive charity to dynamic, asset-based investment, productive waqf can generate sustainable economic returns [4]. Successful models in countries such as Turkey and Malaysia demonstrate that when managed effectively, productive waqf can significantly drive socio-economic development [2]. Nevertheless, the domestic implementation of such models is often hampered by systemic challenges, including inefficient asset management, lack of transparency, and weak stakeholder engagement [6].

Concurrently, greenhouse technology has emerged as a critical tool for agricultural modernization. By offering precise environmental control, maximizing water efficiency, and minimizing crop failure, greenhouses can drastically enhance the productivity of high-value commodities like melons [7]. However, the diffusion of this technology in resource-poor regions remains limited. A disconnect persists between the theoretical potential of ag-tech and its on-the-ground adoption, largely due to financial barriers and social constraints [8].

The integration of productive waqf with greenhouse technology presents a unique opportunity to bridge this gap. This synergy can foster a sustainable business model capable of empowering local communities, generating employment, and bolstering food security [1]. However, achieving this integration requires a comprehensive strategy that harmonizes financial viability with social and environmental objectives. It is essential to understand how Islamic social finance can be effectively coupled with modern agricultural methods to cultivate tangible economic value for local populations.

Despite the potential of this approach, there is a paucity of research exploring the holistic integration of productive waqf and modern agricultural technology as a driver of local development [9]. This study aims to address this gap by examining the mechanisms through which productive waqf can facilitate the adoption of premium melon greenhouse technology [10]. Accordingly, the primary objective of this research is to analyze how this convergence can enhance local economic development, thereby offering a practical business model and a theoretical framework for waqf institutions and farmers [1,11].

Against this backdrop, the research problem focuses on elucidating how a cash waqf model can function as an economic engine for a premium melon greenhouse program, while identifying the subsequent economic impacts and implementation strategies. The novelty of this study lies in its specific exploration of the symbiotic relationship between waqf financing and high-tech agriculture. By investigating this intersection, the research

aims to define precise strategies that maximize development outcomes, contributing significantly to the discourse on sustainable development in Muslim-majority countries.

## **2 Method**

This study employs an inductive approach, designed to uncover novel insights and observations within the specific social context of the premium melon greenhouse waqf. A qualitative research design was adopted to deeply explore the phenomenon of innovation in waqf-based greenhouse melon production. Consistent with the inductive approach [12], the research utilizes data from semi-structured interviews, field observations, and secondary documents, such as academic journals, financial reports, and institutional records, to address the primary objective: examining innovative practices in waqf management and their economic implications.

The research process commenced with an analysis of the relationship between waqf land utilization and the application of greenhouse technology, specifically focusing on its potential to drive local economic development. Following this initial assessment, the study proceeded to identify operational relationships and formulate strategies for optimizing waqf assets through technological integration. Rather than using quantitative prioritization methods, this study focused on a descriptive and strategic analysis of the premium melon greenhouse program to understand the mechanisms of value creation.

The specific object of this research is the Premium Melon Waqf Greenhouse Cluster located in Gunung Kidul. This site was purposively selected as it represents a pioneering model of cash waqf development that successfully integrates premium melon production with modern greenhouse operations. The data collection phase involved in-depth interviews with the cluster's management and key stakeholders to capture a holistic view of the project's implementation. To derive meaningful conclusions, the collected data were examined using qualitative content analysis techniques, allowing for the systematic identification of themes related to economic benefits, operational challenges, and development strategies.

## **3 Results and discussion**

### **3.1 Results**

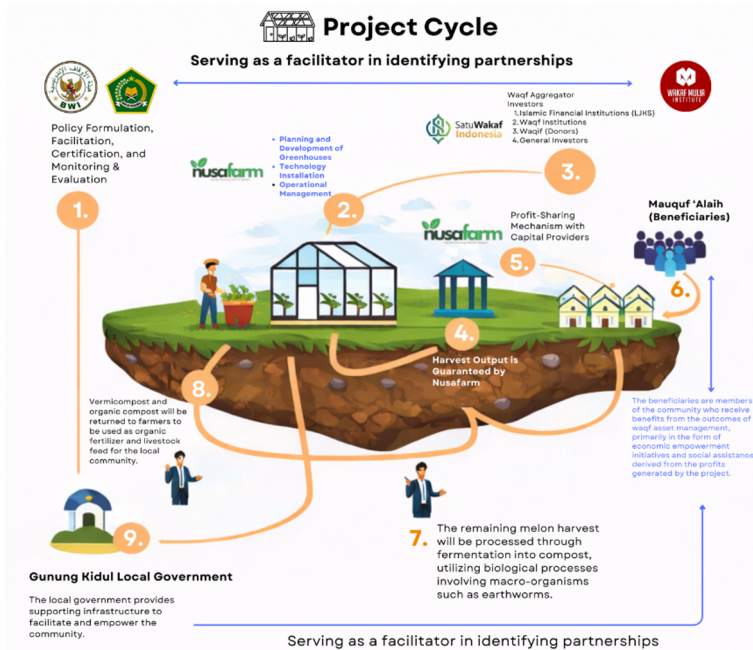
#### *3.1.1 Development model of waqf land through greenhouse technology for high-quality melon production*

The Premium Melon Greenhouse Waqf Program represents a strategic intervention designed to unlock the value of dormant economic assets. Specifically, the program aims to optimize unproductive waqf land, often left fallow due to a lack of capital or expertise, transforming it into high-yield agricultural zones. This initiative is not merely a funding mechanism, but a comprehensive ecosystem built upon a "Triple Helix" style collaboration among three principal entities. First, the Wakaf Mulia Institute acts as the Nazhir for cash waqf, ensuring the mobilization of liquid funds complies with Sharia principles. Second, NU Gunung Kidul serves as the Nazhir for land waqf, providing the

essential physical assets. Third, Nusafarm operates as the professional business partner, bridging the gap between traditional asset ownership and modern agricultural expertise.

The operational framework of this development model is rigorous and systematic, consisting of nine distinct stages that ensure feasibility and sustainability. **Fig. 1** depicts an integrated project cycle that functions as a closed-loop economic system. The cycle begins at the Policy and Regulation Level, where the Indonesian Waqf Board (BWI) and the Ministry of Religious Affairs play a critical supervisory role. Their involvement goes beyond mere administration; they provide the regulatory scaffolding necessary to build investor trust. This includes establishing legal frameworks, facilitating cross-sector partnerships, and conducting certification and monitoring to ensure that all activities strictly adhere to both state regulations and Islamic law.

Following the solidification of policy foundations, the focus shifts to the Technical Implementation Level, delegated to Nusa Farm. As the business operator, Nusa Farm is responsible for the physical and operational transformation of the site. This encompasses the engineering and construction of greenhouse infrastructure, the installation of IoT-based irrigation and climate control systems, and the day-to-day agronomic management of premium melon cultivation. This stage is crucial as it introduces technology transfer to rural areas that historically lack access to modern farming tools.



**Fig. 1.** Model of waqf land development through greenhouse technology [13]

To fuel this ecosystem, the Financial Aggregation Level is managed by SatuWakaf Indonesia. Acting as a financial hub, SatuWakaf mobilizes capital from a diverse spectrum of sources, including Islamic Financial Institutions (LJKS), other waqf foundations, zakat agencies (LAZ), individual retail donors, and corporate investors. This blended finance approach mitigates risk and democratizes investment opportunities. Once the greenhouses are operational, Nusa Farm guarantees the market absorption of the harvest,

ensuring a steady revenue stream. These profits are then redistributed to investors via the SatuWakaf platform, completing the commercial cycle. Crucially, the ultimate objective of this model is to generate a Sustainable Social Impact. A portion of the profits is channeled to beneficiaries (*Mauquf 'alaih*), not as one-off charity, but through structured economic empowerment programs and direct social assistance, thereby creating a long-term safety net for the community.

### *3.1.2 Economic potential of the premium melon greenhouse waqf program*

The Greenhouse Waqf Project serves as a powerful economic accelerator. By integrating the principles of productive waqf with precision agriculture, the project addresses the dual challenges of land underutilization and rural poverty. The economic potential of this initiative is multidimensional, impacting land productivity, financial returns, labor markets, and long-term sustainability.

### *3.1.3 Agronomic transformation and land productivity*

The most immediate impact is the shift from low-intensity farming to high-frequency production. Conventional open-field farming in this region is often limited by seasonal constraints and climate variability. However, the application of greenhouse technology enables a controlled environment that facilitates 3–4 harvest cycles per year. This intensification results in a dramatic increase in output; a single hectare of land is now capable of yielding approximately 35–40 tons of premium melons annually. This consistency creates a reliable supply chain for premium markets, significantly increasing the asset value of the waqf land.

### *3.1.4 Financial viability and capital efficiency*

The project demonstrates robust financial feasibility despite the initial capital requirements. The construction of three Smart Farming Greenhouse Melon units required a total investment of IDR 557,274,000. The cost structure indicates a heavy emphasis on durable assets, with the largest portion (IDR 397,500,000) allocated to greenhouse construction and infrastructure. While the upfront investment is approximately IDR 750 million per hectare, the high operational efficiency and premium pricing of the crop result in a swift Return on Investment (ROI). Projections indicate that the project will reach its break-even point (BEP) within just 2 to 2.5 years, a highly attractive timeline for an agricultural infrastructure project.

### *3.1.5 Labor market multiplier effects*

Beyond asset metrics, the project significantly elevates human capital. It structurally transforms the local labor market by replacing low-wage, informal farm labor with skilled, formal employment. The average monthly salary for a greenhouse technician in this program reaches IDR 2.4 million, which is 142.42% higher than wages in the conventional farming sector. This wage premium is critical for poverty alleviation in rural

Gunung Kidul. Furthermore, the project functions as a vocational training hub, converting unskilled farmers into “agri-technicians” capable of managing complex irrigation and nutritional systems. This direct employment also catalyzes indirect economic activity; it is estimated that each greenhouse job generates at least three indirect employment opportunities in downstream sectors such as logistics, packaging, and marketing.

### *3.1.6 Sustainability and benefit distribution*

The model ensures the longevity of the partnership through a fair and transparent Profit-Sharing Ratio (Nisbah Bagi Hasil). The distribution is designed to align incentives: 50% for Investors: To ensure competitive returns and attract continued capital flow. 35% for the Manager (Nusafarm): To incentivize operational excellence and crop care. 10% for the Land Nazhir: To maintain the waqf asset and support the institution. 5% for the Aggregator: To cover administrative and platform costs.

Based on conservative financial projections, the total profit over a five-year horizon is estimated at IDR 2,648,229,768. Consequently, the yield for investors is projected at IDR 1,324,114,884. This substantial return profile proves that waqf assets, when managed with professional competence and modern technology, can outperform traditional investment vehicles. Thus, this project provides a validated blueprint for Muslim-majority nations seeking to leverage Islamic finance for holistic and sustainable local development.

## **3.2 Discussion**

The findings of this study demonstrate that the integration of productive waqf with greenhouse technology functions as a robust mechanism for revitalizing dormant economic assets. The success of the Premium Melon Greenhouse Waqf Program in Gunung Kidul validates the theoretical proposition that waqf, when managed through professional partnerships, can evolve beyond traditional charity into a sustainable engine for economic growth [14]. The collaborative model identified in the results, involving a strategic “Triple Helix” of the Nazhir, the business operator (Nusa Farm), and the financial aggregator (SatuWakaf), directly addresses the historic inefficiencies often cited in waqf literature, such as the lack of managerial competency among Nazhirs and insufficient capital liquidity [5]. By delegating technical operations to a professional entity while retaining Sharia oversight, this model mitigates the agency problems that frequently hamper the productivity of waqf lands in Indonesia.

The economic outcomes revealed in this study highlight a significant shift in the value proposition of agricultural waqf. The data indicates that greenhouse technicians in this program earn 142.42% more than conventional farmers. This finding is critical, as it suggests that productive waqf can serve as a direct intervention for poverty alleviation (SDG 1) and the provision of decent work (SDG 8). Unlike traditional agricultural interventions that often focus solely on yield increases, this model structurally transforms the labor market by upskilling rural workers into “agri-technicians.” This aligns with recent studies suggesting that the modernization of agriculture is essential for retaining

youth in the rural economy and breaking the cycle of agrarian poverty [1]. The creation of indirect jobs in logistics and marketing further evidences the multiplier effect, proving that the infusion of waqf capital into high-tech sectors generates broad-based economic ripples that extend beyond the immediate beneficiaries.

The study's results emphasizes that the high productivity of the program (35–40 tons/hectare) is intrinsically linked to the adoption of greenhouse technology. In the context of climate change and environmental uncertainty, this technological layer is not merely an efficiency tool but a risk management strategy. By controlling environmental variables, the project minimizes the agricultural risks, such as pest infestations and weather anomalies, that traditionally make agricultural financing unattractive to investors. This finding contributes to the growing body of literature advocating for "Smart Waqf," where asset preservation is achieved through technological adaptation rather than passive land holding. The capability to achieve a break-even point in 2–2.5 years further corroborates that high-tech agriculture offers a competitive risk-return profile suitable for Islamic social finance instruments.

Finally, the financial architecture of the program offers a blueprint for financial sustainability. The transparent profit-sharing ratio (Nisbah) ensures that all stakeholders, remain incentivized to maintain high performance. This departs from the dependency model of traditional philanthropy, moving toward a self-sustaining social enterprise model. The ability of the project to generate a projected 5-year profit of over IDR 2.6 billion demonstrates that cash waqf can compete with conventional investment instruments while delivering superior social impact. This supports the argument by Kachkar, that blended finance, which combines philanthropic capital (waqf) with commercial investment logic [15], is the most viable path for scaling development projects in the Muslim world. By successfully closing the loop between investment, production, and market absorption, this model proves that waqf assets can be "cultivated" to produce genuine, long-term economic value.

## **4 Conclusion**

This research confirms that the integration of productive waqf with greenhouse technology serves as a formidable engine for local economic development. The case study of the Premium Melon Greenhouse Waqf Program in Gunung Kidul demonstrates that when waqf assets are managed through a professional "Triple Helix" collaboration, involving regulatory bodies, financial aggregators, and technical operators, they can transcend traditional passive charity models to become dynamic economic accelerators.

The study yields three critical conclusions. First, regarding economic viability, the application of precision agriculture technology significantly enhances asset productivity, achieving yields of 35–40 tons per hectare and a rapid break-even point of 2 to 2.5 years. This validates that high-tech agriculture is a financially sound investment avenue for cash waqf. Second, regarding social impact, the program successfully addresses structural poverty by elevating the local labor market. By offering wages 142.42% higher than the conventional average and facilitating technology transfer, the initiative transforms unskilled laborers into competent agri-technicians, thereby fulfilling the objectives of SDG 1 (No Poverty) and SDG 8 (Decent Work). Third, regarding sustainability, the

transparent multi-stakeholder profit-sharing model ensures long-term operational resilience, reducing the dependency on continuous donor injection.

Ultimately, this study implies that the future of Islamic social finance lies in its convergence with the real sector's modernization. The model developed in Gunung Kidul provides a scalable and replicable blueprint for waqf institutions across Muslim-majority countries, suggesting that "cultivating economic value" requires a holistic synthesis of spiritual mandate, financial acumen, and technological innovation.

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