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Green Agriculture Implementation Through Leadership and HR Training Development at Jombang Regency Agriculture Office

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Abstract

Purpose: This study analyzes green agriculture implementation strategies in Jombang Regency, East Java, Indonesia, focusing on leadership roles and human resource (HR) training and development within the Agriculture Office. It highlights the importance of institutional leadership and HR capacity building in supporting sustainable farming practices amid global demands for food sustainability and Indonesia's agricultural self-sufficiency challenges.

Research Methodology: This study used an exploratory qualitative approach. Data were collected through field observations, interviews with key stakeholders, and document analysis, then analyzed using thematic analysis.

Results: Green agriculture in Jombang has developed through three models: System of Rice Intensification (SRI), Organic Rice Farming, and Healthy Crop Cultivation. While all models were effective during implementation, SRI and organic programs were discontinued due to weak institutional continuity, limited market access, and declining farmer participation. Leadership at both institutional and farmer-group levels significantly influenced sustainability. The current BTS model shows promising results supported by strong multi-stakeholder collaboration.

Conclusions: Sustainable green agriculture requires integrated leadership at institutional and community levels, continuous HR development, cross-sector collaboration, and long-term policy support. The BTS model reflects lessons learned from previous program failures.

Limitations: This single-regency qualitative case study limits generalizability and does not include quantitative impact measurement.

Contributions: The study provides a comparative analysis of three green agriculture models, offering insights into leadership and HR conditions essential for sustainable agricultural transformation and practical policy recommendations.

Keywords: *Green Agriculture, Sustainable Farming, Leadership, Human Resource Development, Jombang Regency*

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1. Introduction

Global food security has become one of the defining geopolitical and developmental challenges of the twenty-first century. Climate change, soil degradation, and demographic pressure combine to place unprecedented strain on agricultural systems worldwide, with particular severity in densely populated

tropical nations such as Indonesia (FAO, 2020). Indonesia—an archipelagic nation of over 270 million people—faces a distinctive agricultural challenge: achieving and sustaining food self-sufficiency while confronting three interrelated structural obstacles. First, climate change is altering rainfall patterns, intensifying pest pressures, and disrupting the planting calendars that underpin Indonesia's rice-based food system (Saleh, Heryadi, Kambali, Aspirani, & Abdullah, 2024). Second, decades of intensive chemical-dependent agriculture have degraded soil fertility across key production areas, reducing the long-term productive capacity of agricultural land (McLennon, Dari, Jha, Sihi, & Kankarla, 2021). Third, agricultural human resources are aging, declining in numbers, and increasingly attracted to non-agricultural occupations—creating a workforce crisis that threatens the generational continuity of farming knowledge and practice (Limpo, Agung, Pasandaran, & Syakir, 2022).

Green agriculture is a sustainable agricultural approach that seeks to balance productivity, environmental conservation, and social welfare by promoting efficient resource use, reducing dependence on synthetic chemicals, and maintaining ecosystem integrity (Rudnicki, Biczkowski, Wiśniewski, Wiśniewski, Bielski, & Marks-Bielska, 2023Liu, Sun, Wang, Wang, Yu, & Zhao, 2020). This approach emphasizes soil and water conservation, biodiversity protection, integrated pest management, organic and biological inputs, and environmentally friendly cultivation practices that minimize pollution and greenhouse gas emissions. In the Indonesian context, green agriculture includes practices such as the System of Rice Intensification (SRI), organic farming, integrated crop management, and other low-chemical cultivation systems designed to improve productivity while preserving environmental quality. By integrating ecological principles with agricultural production, green agriculture contributes to food security, climate resilience, farmer welfare, and the achievement of sustainable development goals, making it an important strategy for the long-term sustainability of the agricultural sector (Boix-Fayos, & De, 2023 Endaryanto, Zakaria, Indah, & Seta, 2022).

Green agriculture—defined as an approach to farming that prioritizes ecological balance, resource efficiency, and biodiversity conservation while maintaining or improving agricultural productivity—represents a theoretically coherent and practically viable response to all three of these challenges (Ume, & Bahta, 2024Boix-Fayos and De, 2023). By reducing chemical input dependency, improving soil health through biological and organic practices, and building farmer competence in adaptive and ecosystem-sensitive cultivation methods, green agriculture addresses the environmental, agronomic, and human capital dimensions of sustainable food production simultaneously. The challenge, however, is not conceptual but implementational: translating green agriculture principles into durable field-level practice change among farmers with existing cultivation habits, economic pressures, and limited access to training and market infrastructure (Turner & Nguyen, 2020);(Liu et al., 2020).

Two organizational factors are theoretically identified as primary determinants of green agriculture implementation success: leadership and human resource training and development. Leadership—at both the institutional level of the Agriculture Office and the local level of farmer groups and village governments—creates the strategic vision, motivational environment, and accountability structures that enable program adoption and continuity (Wasahua, 2017 Ume and Bahta, 2024). Human resource training and development builds the technical competence, conceptual understanding, and adaptive capacity that farmers and agricultural extension officers need to implement green farming practices effectively and sustainably (Noe, Hollenbeck, Gerhart, & Wright, 2020; Mathis, & Jackson, 2019).

Jombang Regency in East Java Province presents a particularly instructive case for studying these dynamics (Sujianto, Gunawan, Saptana, Syahyuti, Darwis, Ashari, & Marhendro, 2022) . As one of East Java's established rice-producing areas, Jombang has implemented green agriculture in successive phases since 2008—providing longitudinal evidence of how different leadership configurations and HR development approaches produce different sustainability outcomes across three distinct green farming models: the System of Rice Intensification (SRI), Organic Rice Farming, and Healthy Crop Cultivation (BTS) (Rozaki, Yudanto, Triyono, Alifah, Ardila, Pamungkas, & Man, 2024). The comparative analysis of these three models within a single regency context generates

unique insights into the institutional, leadership, and human capital conditions that determine whether green agriculture programs achieve durable adoption or early discontinuation (Dessler, 2017;Yanakittkul, & Aungvaravong, 2020).

This study addresses five research questions: (1) How has green agriculture been implemented in Jombang Regency? (2) What government policies support green agriculture implementation? (3) How does leadership shape green agriculture implementation? (4) How does HR training and development support green agriculture? and (5) What are the strategic potentials and development directions for green agriculture in Jombang Regency?

2. Literature Review and Hypothesis/es Development

2.1 Green Agriculture: Concept and Theoretical Foundations

Green agriculture encompasses cultivation approaches that minimize negative environmental impacts, prioritize ecosystem balance, and maximize resource use efficiency to produce safe, high-quality agricultural products (Ume & Bahta, 2024). (Boix-Fayos & De, 2023) defines it as a holistic and sustainable farming approach that prioritizes environmental health, resource efficiency, and biodiversity conservation. (Endaryanto, Zakaria, Indah, & Seta, 2022) identifies the core principles as: improving human welfare by meeting basic food and livelihood needs; reducing negative environmental externalities and reliance on external inputs; and maintaining the diversity of species, habitats, and agricultural landscapes. In the Indonesian context, green agriculture encompasses SRI, organic farming, integrated crop management, and low-chemical cultivation systems that reduce the heavy chemical dependence of conventional rice intensification programs (Febrian, Ardista, Kutoyo, Suryana, Febrina, Kusnadi, Suryawan, Purba, Turi, Sudiarti, Libriantono, Perwitasari, & Irwanto, 2022).

The global case for green agriculture transition is underscored by the evidence on conventional agriculture's systemic costs: soil fertility depletion, pesticide-induced ecological damage, water contamination, and greenhouse gas emissions that compromise the long-term sustainability of the food system (FAO, 2020). Pertiwi (2024)(Rudnicki, Biczkowski, Wiśniewski, Wiśniewski, Bielski, & Marks-Bielska, 2023) situates green agriculture within Indonesia's Sustainable Development Goals commitments, arguing that its implementation constitutes a policy imperative rather than an optional enhancement—particularly as global food security challenges intensify and domestic production capacity faces accelerating environmental stress (Rudnicki et al., 2023).

Beyond technological and ecological dimensions, the successful implementation of green agriculture is strongly influenced by institutional capacity, leadership commitment, and human resource development. Effective leadership plays a critical role in formulating policies, mobilizing stakeholders, allocating resources, and fostering innovation necessary for the adoption of sustainable farming practices (Liu, Zhu, & Wang, 2021Paillé, Valéau, & Renwick, 2020). Likewise, continuous training and capacity-building programs enable farmers and agricultural extension personnel to acquire the knowledge and skills required to implement environmentally friendly cultivation methods and adapt to changing agricultural conditions (Iriawan, 2020). Previous studies have shown that green agriculture initiatives are more likely to be sustained when supported by strong leadership, participatory governance, and systematic farmer education programs that encourage behavioral change and technology adoption. Consequently, leadership and human resource development should be regarded as essential institutional pillars for achieving long-term agricultural sustainability and food security goals (Nyame-Asiamah & Ghulam, 2020);(Rahdari, Sheehy, Khan, Braendle, Rexhepi, & Sepasi, 2020).

2.2 Leadership in Agricultural Organizations

Leadership in organizational contexts is the capacity to influence people and systems toward the achievement of shared goals that produce beneficial impacts for the organization and its stakeholders (Wasahua, 2017; Iriawan, 2020). In agricultural development programs, leadership operates at two distinct but complementary levels: institutional leadership—exercised by Agriculture Office heads and extension unit managers who set programmatic direction, secure budget support, and create the policy infrastructure for implementation—and local leadership—exercised by farmer group heads and respected community figures who translate institutional programs into grassroots adoption and provide the motivational energy that sustains farmers' engagement with new and unfamiliar cultivation methods (Ume & Bahta, 2024). (Saleh, Heryadi, Kambali, Aspirani, & Abdullah, 2024) specifically emphasizes that effective leaders in agricultural institutions must possess conceptual understanding (comprehending the vision and strategic direction of green farming), human skills (building trust and motivation among farmers and extension officers), and technical competence (understanding the agronomic principles of the cultivation methods they promote). The absence of any of these leadership capabilities creates implementation gaps that technical training and financial support alone cannot fill (Wang, Cheah, Lim, Kumar, Lim, & Towers, 2024).

Contemporary leadership literature increasingly highlights the importance of transformational and collaborative leadership in advancing sustainable agricultural development. Transformational leaders inspire stakeholders to embrace innovation, encourage long-term commitment to environmental goals, and create a shared vision for sustainable farming practices (Schleper, Gold, Trautrims, & Baldock, 2021). At the same time, collaborative leadership facilitates coordination among government agencies, extension services, farmer groups, private-sector actors, and local communities, thereby strengthening institutional support for green agriculture initiatives (Sallnäs & Björklund, 2020). Research indicates that sustainable agricultural programs are more successful when leaders act not only as decision-makers but also as facilitators, mentors, and change agents who foster participation, knowledge sharing, and collective problem-solving. In this context, leadership effectiveness is reflected in the ability to build stakeholder commitment, manage organizational change, and sustain program continuity despite economic, social, and environmental challenges (Dal, Tucker, Massaro, & Bagnoli, 2022) (Rahdari, Sheehy, Khan, Braendle, Rexhepi, & Sepasi, 2020).

Leadership also plays a critical role in ensuring the sustainability of green agriculture programs beyond their initial implementation stages. Many agricultural innovations achieve short-term success but struggle to maintain farmer participation and institutional support over time (Nisar, Haider, Ali, Jamshed, Ryu, & Gill, 2021). Effective leaders help address this challenge by establishing long-term strategic visions, securing policy and financial commitments, and creating mechanisms for continuous stakeholder engagement. Through consistent communication, monitoring, and adaptive decision-making, leaders can respond to emerging challenges while maintaining program momentum. Consequently, leadership functions not only as a catalyst for the adoption of green agricultural practices but also as a key determinant of their long-term institutionalization and contribution to sustainable rural development (Wang, Gao, Li, Shakoor, Sun, Jiang, & Zhang, 2023)

2.3 Human Resource Training and Development in Agriculture

Human resource development (HRD) encompasses education, training, coaching, and field demonstration activities designed to improve both technical and managerial capabilities of agricultural personnel (Noe, Hollenbeck, Gerhart, & Wright, 2020; Mathis, & Jackson, 2019). In green agriculture implementation contexts, HRD must address three distinct competency categories: conceptual orientation (understanding why green farming is important and what its ecological and economic principles are), technical proficiency (how to implement specific green cultivation practices including soil preparation, seed selection, water management, biological pest control, and organic fertilization), and strategic implementation capability (how to engage farmers, manage resistance to change, build social learning networks, and sustain program momentum across planting seasons) (Turner, &

Nguyen, 2020(Fang, Hu, Mao, & Chen, 2021)). The last of these—strategic implementation capability—is the most organizationally demanding and least amenable to conventional training approaches, as it requires both interpersonal competencies and context-specific judgment that develop through practice and mentoring rather than classroom instruction alone (Noe et al., 2020; (Hilton, Madilo, Awaah, & Arkorful, 2023)).

Recent studies emphasize that effective human resource development in agriculture should adopt a continuous learning approach rather than relying solely on one-time training interventions (Arunrat, Sereenonchai, & Wang, 2021). Farmers and extension personnel operate in dynamic environments characterized by changing climatic conditions, evolving market demands, and technological advancements. Consequently, capacity-building programs must be designed as ongoing processes that combine formal training, field demonstrations, peer-to-peer learning, mentoring, and experiential learning opportunities. Such approaches enable participants to reinforce knowledge, adapt innovations to local conditions, and develop problem-solving skills that support the long-term implementation of sustainable agricultural practices (Ambarsari & Sunaryanto, 2022).

Furthermore, the success of green agriculture initiatives depends not only on the availability of technical knowledge but also on the ability of human resource development programs to influence attitudes and behavioral change. The adoption of environmentally friendly farming methods often requires farmers to move away from familiar conventional practices and accept short-term uncertainties in pursuit of long-term benefits (Mao, Zhou, Ying, & Pan, 2021 (Wang, Cheah, Lim, Kumar, Lim, & Towers, 2024)). Research indicates that training programs are more effective when they incorporate participatory methods, encourage farmer involvement in decision-making, and demonstrate tangible economic and environmental outcomes. Through these mechanisms, HRD contributes not only to individual competency improvement but also to the creation of learning-oriented agricultural communities that can sustain innovation and support the broader transition toward sustainable agriculture (Zaim, Demir, & Budur, 2021).

In addition, agricultural extension services serve as a critical bridge between policy objectives and on-farm implementation. Extension officers who receive adequate training are better equipped to disseminate innovations, provide technical assistance, and facilitate communication among farmers, government institutions, and other stakeholders. Their effectiveness directly influences the rate of technology adoption and the sustainability of agricultural development programs. Therefore, strengthening the competencies of extension personnel through systematic HRD initiatives is essential for enhancing institutional capacity and ensuring the successful implementation of green agriculture at the local level (Alrowwad, Abualoush, & Masa, 2020).

2.4 Conceptual Framework

The conceptual framework for this study identifies three inter-related process dimensions through which leadership and HR training and development shape green agriculture implementation outcomes. First, the Policy and Institutional Dimension encompasses the government policy framework, regulatory support, budget allocation, and inter-agency coordination structures that establish the enabling environment for green farming adoption. Second, the Leadership Dimension includes both institutional leadership (Agriculture Office heads, extension unit managers) and local leadership (farmer group leaders, village heads, and respected farmer figures) whose combined influence determines the motivational climate, technical direction, and accountability culture within which green farming is implemented. Third, the Human Capital Dimension encompasses the training, workshops, field schools, and mentoring activities through which farmers and agricultural extension officers develop the conceptual, technical, and strategic competencies required for effective and sustainable green farming practice.

These three dimensions jointly determine implementation outcomes—specifically, the productivity impacts of green farming models, their ecological sustainability effects (soil health, chemical input

reduction, biodiversity), their economic viability (income effects, cost structures, market access), and ultimately the durability of adoption—whether green farming becomes a sustained community practice or a time-limited project that concludes when external support is withdrawn. This framework draws on Purnomo et al. (2018, 2024) and the broader leadership and HRD literatures to connect organizational enablers with agricultural sustainability outcomes.

3. Research Methodology

3.1 Research Design

This study employs an exploratory qualitative research design Creswell & Poth, 2018, appropriate for investigating the complex, context-embedded processes through which green agriculture policy is formulated, implemented, and sustained in a specific regency setting. The exploratory orientation reflects the study's objective of developing a nuanced understanding of 'how' and 'why' green agriculture implementation succeeds or faces challenges—questions that require depth, context-sensitivity, and interpretive analysis rather than statistical hypothesis testing.

3.2 Research Site

The research was conducted at the Agriculture Office of Jombang Regency (Dinas Pertanian Kabupaten Jombang), located at Jl. Soekarno-Hatta No. 170, Jombang, East Java. Field research also extended to implementation sites: Sudimoro Village, Megaluh District (SRI implementation); Kudu Village, Kudu District (Organic Rice Farming, Banjarsari Farmer Group); and Kendalsari Village, Sumobito District (BTS/Healthy Crop Cultivation). Jombang Regency was selected because of its longitudinal green agriculture implementation experience (2008 to present), the diversity of green farming models implemented, and the availability of key informants with direct program management experience across all three models.

3.3 Data Collection

Primary data were collected through three complementary methods. Semi-structured in-depth interviews were conducted with key informants including: the Head of the Agriculture Office of Jombang Regency; the Head of the Agricultural Extension Unit (UPT); field agricultural extension officers; the head of the Banjarsari Farmer Group (Aspandi); the head of the RPH Kendalsari Pest Control Team (Ikhwan); and prominent farmer figures from each of the three implementation sites. Interviews were guided by question frameworks organized around the five research questions, with probing questions designed to elicit detailed narrative accounts of implementation experiences, leadership challenges, training impacts, and sustainability constraints. Field observation was conducted at current BTS implementation sites to directly observe cultivation practices, farmer participation, and infrastructure conditions. Document analysis was applied to government policy documents, program budget records, training documentation, organic certification records, and published research on Jombang Regency's SRI implementation (Endaryanto, Zakaria, Indah, & Seta, 2022).

3.4 Data Analysis

Thematic analysis was applied to the interview transcripts, observational notes, and documentary data. Coding followed the five thematic domains defined by the research questions, with additional emergent codes identified through repeated reading of the data. Triangulation across interview, observation, and documentary data sources enhanced the credibility of findings. Member checking was conducted with two senior informants (Head of Agriculture Office and one farmer group leader) to confirm the accuracy of key factual claims. Transferability is supported through thick description of the research context.

4. Results and Discussions

4.1 Green Agriculture Implementation in Jombang Regency: An Overview

Jombang Regency has implemented green agriculture through three successive models spanning 2008 to the present. These three models—SRI, Organic Rice Farming, and BTS—represent a progressive institutional learning trajectory in which each implementation phase draws lessons from the limitations and discontinuities of the preceding phase. Table 1 provides a comparative overview of the three models across key implementation dimensions.

Table 1. Comparative Overview of Green Agriculture Models in Jombang Regency

Dimension	SRI (2008–discontinued)	Organic Rice (2013–2024)	BTS (2024–present)
Location	Sudimoro Village, Megaluh District	Banjarsari Farmer Group, Kudu District	Multiple sites across Jombang Regency
Start Year	2008	2013	2024
Initiating Factor	Ministry of Agriculture APBN funding	NGO training, Dept. of Agriculture support	RPH (Pest Control Teams) institutional function
Productivity Effect	SRI: 8,321.92 kg/ha vs non-SRI: 6,828.16 kg/ha	Certification achieved; income premium over conventional rice	Increased production, reduced costs; 2 seasons satisfactory results
Local Leadership	Sunan (Village Head, Sudimoro)	Aspandi (Farmer Group Leader)	Ikhwan (RPH head, Kendalsari hamlet head)
Certification	–	Lesos Organic Certification (2015); Brand: 'Ringin Cone Rice'	–
Program Status	Discontinued; no active SRI farmers as of 2024	Ceased operations 2024 (11 years of operation)	Active; provincial expansion 25 ha approved 2025
Support Structure	APBN; Dept. of Agriculture	NGO; Dept. of Agriculture; market development	Dept. of Agriculture; village governments; PT MHI; Kliring Berjangka; AFCO Group; universities

Source: Source: Field Research, Agriculture Office of Jombang Regency, 2024–2025

Table 1 provides a comprehensive comparison of the three green agriculture models that have been implemented in Jombang Regency over different periods, namely the System of Rice Intensification (SRI), Organic Rice Farming, and Healthy Crop Cultivation (BTS). The table summarizes key dimensions of each model, including implementation location, initiation period, driving factors, productivity outcomes, leadership characteristics, certification achievements, support structures, and current program status. The comparison demonstrates that although all three models generated positive outcomes during their active implementation phases, their levels of sustainability varied considerably. SRI and Organic Rice Farming succeeded in increasing productivity and creating economic benefits for participating farmers; however, both programs were eventually discontinued due to challenges related to institutional continuity, market sustainability, and farmer participation. In contrast, the BTS model remains active and has shown promising early results, supported by broader stakeholder collaboration involving government agencies, village administrations, private-sector partners, financial institutions, and universities. The table further illustrates the critical role of both institutional and local leadership in sustaining green agriculture initiatives, highlighting how leadership commitment, organizational support, and multi-stakeholder engagement contribute to the long-term viability of environmentally sustainable farming systems. Overall, the comparison provides

important insights into the factors that facilitate or constrain the successful implementation and sustainability of green agriculture programs in the regional context of Indonesia.

4.2 System of Rice Intensification (SRI)

The SRI program—launched in 2008 in Sudimoro Village, Megaluh District, with Ministry of Agriculture funding—demonstrated measurable productivity improvements. Research by Erwinata et al. (2013) confirmed that SRI farming averaged 8,321.92 kg/ha compared to 6,828.16 kg/ha for non-SRI farming, representing a 22% productivity advantage. Average SRI income of IDR 14,382,554.64/ha exceeded non-SRI income of IDR 11,403,523.81/ha by 26%. Despite these economically compelling results, the SRI program in Jombang has been discontinued. According to the Head of the Agricultural Extension UPT, no active SRI practitioners remain in Jombang Regency as of the time of this research. The critical discontinuity factor was the absence of a self-sustaining institutional and leadership structure capable of maintaining program momentum after the initial APBN funding cycle ended. While local leadership through Sunan (the Sudimoro Village Head) was effective during the active implementation phase, this leadership was not transferable to successor figures and did not generate a sufficiently broad community of practice to sustain adoption independently of external support.

4.3 Organic Rice Farming

Organic rice farming is a cultivation system that emphasizes the use of natural inputs and ecological processes while minimizing or eliminating synthetic fertilizers, pesticides, and other chemical substances. The primary objective of organic rice farming is to maintain soil fertility, preserve environmental quality, and produce safe and healthy food products while ensuring long-term agricultural sustainability (Rozaki, Yudanto, Triyono, Alifah, Ardila, Pamungkas, & Man, 2024). Organic rice cultivation typically involves the application of organic fertilizers, biological pest management, crop rotation, and the enhancement of soil biodiversity to support natural ecosystem functions (Arunrat, Sereenonchai, & Wang, 2021). In addition to its environmental benefits, organic rice farming has been associated with improved soil health, reduced production-related pollution, and the creation of market opportunities through premium-priced agricultural products. However, its successful implementation requires strong farmer commitment, adequate technical knowledge, certification support, and effective market access to ensure economic viability and long-term adoption (Sujianto, Gunawan, Saptana, Syahyuti, Darwis, Ashari, & Marhendro, 2022 ;Komatsuzaki, & Syuaib, 2010).

Organic rice farming began in the Banjarsari Farmer Group in Kudu District in 2013, following an NGO-facilitated training that introduced farmers to environmentally friendly cultivation principles. The Agriculture Department subsequently supported the group's development with post-harvest equipment, storage facilities, and technical guidance toward organic certification. In 2015, the Banjarsari Farmer Group achieved organic certification from the Lesos Organic Certification Agency, enabling branded marketing of 'Ringin Cone Rice' as a Jombang Regency icon. Aspandi, the farmer group leader, provided the local leadership and organizational energy that sustained the program through its development phase. However, organic rice productivity declined relative to conventional farming—a trade-off that discouraged participation expansion. Market development efforts were insufficient to compensate through premium pricing, and the program's participating farmer base aged without younger entrants. Organic rice farming in Banjarsari ceased operations in 2024 after 11 years —a longer run than SRI but ultimately unsustained. The organic farming case highlights three sustainability constraints that are structural rather than idiosyncratic: productivity reduction during the organic transition, market infrastructure insufficiency for premium product absorption, and the demographic challenge of aging farmer participation without succession planning.

4.4 Healthy Crop Cultivation (BTS)

Healthy Crop Cultivation (BTS—Budidaya Tanaman Sehat) represents the current phase of green agriculture implementation in Jombang Regency, initiated in 2024. BTS is distinguished from both SRI and organic farming by: its more permissive standard (allowing limited chemical use under specified conditions, unlike full organic prohibition); its institutional delivery channel (the Pest Control Teams/RPH, which have a structural function within the Agriculture Office system); and its multi-stakeholder support architecture (involving the Department of Agriculture, village governments, PT MHI, Kliring Berjangka Indonesia, AFCO Group, and universities). The 2024 pilot covered 50 hectares across several Jombang Regency locations. Trial results were satisfactory: production costs decreased, yields increased, and ecological indicators improved through the substitution of biological pest control agents for chemical pesticides and significant reduction in herbicide use. Rice produced under BTS was reported by RPH head Ikhwan to have better storage properties—lasting longer without spoilage—a quality attribute with direct market value implications. In 2025, the Provincial Government of East Java approved 25 additional hectares for BTS expansion, and the Department of Agriculture plans to establish model BTS villages in each sub-district (1 hectare per sub-district), complemented by BTS adoption on Agricultural Extension Center managed lands. The BTS model's early trajectory suggests that its multi-stakeholder collaboration structure, permissive transition standards (reducing the productivity sacrifice of full organics), and institutional embeddedness within the RPH system may address the sustainability deficits that undermined SRI and organic rice farming.

4.5 Government Policy Support

The Jombang Regency Government has maintained consistent policy support for green agriculture development across all three implementation models, though the form and instruments of support have evolved. Direct support has encompassed: capacity building for farmers through field schools, workshops, and training programs; provision of farming infrastructure and post-harvest equipment; technical guidance from extension officers; and, in the organic farming case, assistance with certification acquisition. Institutional capacity has been strengthened through the establishment of an Integrated Laboratory at the Agriculture Office, providing analytical support for soil health assessment and biological material development relevant to BTS. A current and forward-looking policy priority is the Regent of Jombang's healthy food zone initiative, which provides a specific spatial and policy framework for BTS expansion and creates demand-side incentives—particularly for institutional food procurement—that could address the market access constraints that limited organic rice scaling.

A critical finding from the comparative analysis of three models is that government support, while necessary, has not been sufficient for program sustainability without complementary leadership continuity and self-sustaining HR capacity at the farmer community level. Policy frameworks that treat green agriculture as a project rather than a permanent systemic change—with time-limited budget support and program cycles—generate implementation-then-discontinuation patterns that characterize both SRI and organic rice farming in Jombang. The emerging BTS model, with its village government integration, private sector partnership, and RPH institutional embedding, is designed to address this structural sustainability deficit.

4.6 The Role of Leadership

The analysis of all three green agriculture models confirms that leadership is not merely a facilitating factor but a determinative one for program sustainability. At the institutional level, the leadership capacity of Agriculture Office heads directly shapes programmatic ambition, resource mobilization, and the quality of inter-agency coordination that determines whether programs receive the multi-sector support they require. At the local level, the farmer group heads and community figures who serve as program champions—Sunan in SRI, Aspandi in organic farming, and Ikhwan in BTS—provide the motivation, social credibility, and grassroots organizational capacity that translate institutional programs into actual behavioral change among farmers.

A consistent finding across all three models is the asymmetric dependence of program sustainability on local leadership quality. When local leader commitment and capability were strong (as with Aspandi in organic farming), programs achieved measurable outcomes over extended periods. When local leaders aged, disengaged, or were not replaced by capable successors, programs declined even when technical quality and institutional support remained adequate. This finding has a direct strategic implication: green agriculture development programs must invest in local leadership identification, development, and succession planning as explicitly as they invest in technical training and physical infrastructure provision. (Hilton, Madilo, Awaah, & Arkorful, 2023) confirm that leadership effectiveness is a critical organizational performance determinant; this principle applies as much to farmer group leaders as to corporate managers.

4.7 Human Resource Training and Development

Human resource capacity building has been an explicit component of all three green agriculture programs in Jombang Regency, delivered through training sessions, workshops, and field schools targeting both farmers and agricultural extension officers. Field schools—where farmers learn through guided practical experience in demonstration plots over a growing season—were identified by informants as the most effective training modality, as they enable real-time problem-solving, contextual learning, and the peer social dynamics that support behavior change in farming communities (Turner & Nguyen, 2020). Training sessions and workshops were effective for conceptual orientation and technical knowledge transfer but less effective for the adaptive implementation skills that determine whether farmers successfully translate general principles into specific management decisions in their own fields.

A critical HR development insight that emerges from the comparative model analysis is the distinction between farmer technical capacity—which can be built through training—and strategic implementation capacity—the ability to navigate community resistance, manage the social dynamics of group farming initiatives, and sustain farmer motivation across the productivity dip that typically accompanies the organic transition phase (Komatsuzaki & Syuaib, 2010). The discontinuation of both SRI and organic rice farming in Jombang suggests that training programs did not adequately develop this strategic capacity, leaving programs without the community resilience needed to sustain through the challenging early phases of adoption. Future HR development programs should explicitly incorporate social facilitation skills, change management principles, and community organizing competencies alongside conventional technical agricultural training (Wang, Cheah, Lim, Kumar, Lim, & Towers, 2024).

4.8 Potential and Strategies for Green Agriculture Development

Green agriculture in Jombang Regency has strong developmental potential supported by three convergent drivers: (1) the accelerating degradation of agro-ecosystems and declining soil fertility that is making conventional chemical-intensive farming increasingly uneconomic; (2) rising consumer and institutional demand for healthy, certified food products that creates a market premium pathway for green agriculture products; and (3) the global low-emission agriculture imperative, which positions green farming as both an environmental responsibility and a potential source of carbon credit and sustainability certification value. The BTS model's early performance—improved productivity, reduced costs, better rice quality, and lower ecological impact—demonstrates that green agriculture can be economically competitive with conventional farming within a relatively short adoption horizon when biological input costs are managed through collective procurement and local production (Sujianto, Gunawan, Saptana, Syahyuti, Darwis, Ashari, & Marhendro, 2022Rozaki, Yudanto, Triyono, Alifah, Ardila, Pamungkas, & Man, 2024).

The key strategic direction for green agriculture development in Jombang Regency, as confirmed by informants at the Agriculture Office, is to build broad multi-sector collaboration—integrating the Department of Agriculture, village administrations, private sector partners, and universities into a

comprehensive support ecosystem. This collaborative architecture has already proven more effective in BTS implementation than the government-centric support models of SRI and organic farming. To ensure long-term sustainability, however, this collaboration must be anchored in formal policy frameworks—including regency-level legislation or regulation that embeds green agriculture as a permanent programmatic commitment rather than a project-phase initiative—and in market development infrastructure that creates reliable premium channels for green agriculture products.

5. Conclusions

5.1 Conclusion

This exploratory qualitative study analyzed green agriculture implementation in Jombang Regency through the lenses of leadership and HR training and development, examining three successive implementation models from 2008 to the present. Five principal conclusions are drawn. First, green agriculture in Jombang Regency has been implemented through three major models—SRI (2008, discontinued), Organic Rice Farming (2013–2024), and BTS/Healthy Crop Cultivation (2024–present)—each demonstrating positive productivity and ecological results during active phases but differing significantly in sustainability trajectories. Second, Jombang Regency government policy support has been consistent and multi-faceted, encompassing training, infrastructure provision, certification support, and institutional capacity building; however, project-cycle-dependent support without permanent policy anchoring has contributed to program discontinuities in SRI and organic farming. Third, leadership—both at the institutional level of the Agriculture Office and the local level of farmer groups and village governments—is the determinative factor for green agriculture sustainability; local leader continuity and succession represent the most critical and most neglected dimension of program sustainability planning. Fourth, HR capacity building through training, workshops, and field schools has been effective for technical knowledge transfer but insufficient for developing the strategic implementation capacity and community resilience that sustain programs through the challenging early adoption phases; future programs must explicitly incorporate social facilitation, change management, and community organizing competencies into their training curricula. Fifth, green agriculture has strong development potential in Jombang Regency, driven by ecosystem degradation pressures, market demand for healthy food, and global low-emission agriculture imperatives; the BTS model's multi-stakeholder collaboration architecture and institutional embeddedness position it as the most promising platform for achieving sustainable scale in the current phase.

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Author Contributions

AJM contributed to conceptualization, methodology, and writing of the original draft; BRP was responsible for data collection, formal analysis, literature review, and final manuscript review. All authors have read and approved the final version of the manuscript.

Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this study. This research was conducted independently, and no financial or personal relationships influenced the results or interpretation of the findings.

References

Alrowwad, A. A., Abualoush, S. H., & Masa'deh, R. E. (2020). Innovation and intellectual capital as intermediary variables among transformational leadership, transactional leadership, and organizational performance. *Journal of Management Development*, *39*(2), 196-222. https://doi.org/10.1108/JMD-02-2019-0062

Ambarsari, D. A., & Sunaryanto, L. T. (2022). Peran Kepemimpinan dalam Keberhasilan Pengembangan Paguyuban Petani Al Barokah di Desa Ketapang Kecamatan Susukan Kabupaten Semarang Jawa Tengah. *Jurnal Ilmiah Membangun Desa Dan Pertanian*, *7*(6), 215-225. https://doi.org/10.37149/jimdp.v7i6.187

Arunrat, N., Sereenonchai, S., & Wang, C. (2021). Carbon footprint and predicting the impact of climate change on carbon sequestration ecosystem services of organic rice farming and conventional rice farming: A case study in Phichit province, Thailand. *Journal of Environmental Management, 289, 112458*. https://doi.org/10.1016/j.jenvman.2021.112458

Boix-Fayos, C., & De Vente, J. (2023). Challenges and potential pathways towards sustainable agriculture within the European Green Deal. *Agricultural Systems, 207, 103634*. https://doi.org/10.1016/j.agsy.2023.103634

Creswell, J. W., & Poth, C. N. (2018). *Qualitative inquiry and research design: Choosing among five approaches (4th ed.)*.

Dal Mas, F., Tucker, W., Massaro, M., & Bagnoli, C. (2022). Corporate social responsibility in the retail business: A case study. *Corporate Social Responsibility and Environmental Management*, *29*(1), 223-232. https://doi.org/10.1002/csr.2198

Dessler, G. (2017). *Human resources management (15th ed.)*.

Endaryanto, T., Zakaria, W. A., Indah, L. S. M., & Seta, A. P. (2022). Strategies and policies to increase competitiveness of cassava in Lampung Province, Indonesia. *Jurnal Manajemen & Agribisnis*, *19*(3), 492-500. https://doi.org/10.17358/jma.19.3.492

Fang, L., Hu, R., Mao, H., & Chen, S. (2021). How crop insurance influences agricultural green total factor productivity: Evidence from Chinese farmers. *Journal of Cleaner Production, 321, 128977*. https://doi.org/10.1016/j.jclepro.2021.128977

FAO. (2020). *The state of food and agriculture: Overcoming water challenges in agriculture*.

Febrian, W. D., Ardista, R., Kutoyo, M. S., Suryana, Y., Febrina, W., Kusnadi, K., Suryawan, R. F., Purba, T. Y. B., Turi, L. O., Sudiarti, S., Libriantono, B., Perwitasari, E. P., & Irwanto, I. (2022). Manajemen sumber daya manusia [Human resource management]. In S. S. Atmodjo (Eds.), *In S. S. Atmodjo (Ed.), Eureka Media Aksara*.

Hilton, S. K., Madilo, W., Awaah, F., & Arkorful, H. (2023). Dimensions of transformational leadership and organizational performance: the mediating effect of job satisfaction. *Management Research Review*, *46*(1), 1-19. https://doi.org/10.1108/MRR-02-2021-0152

Iriawan, S. B. (2020). *Manajemen kinerja organisasi: Peran kepemimpinan [Organizational performance management: The role of leadership]*.

Komatsuzaki, M., & Syuaib, M. F. (2010). Comparison of the farming system and carbon sequestration between conventional and organic rice production in West Java, Indonesia. *Sustainability*, *2*(3), 833-843. https://doi.org/10.3390/su2030833

Limpo, S. Y., Agung, N., Pasandaran, E., & Syakir, M. (2022). *Revisiting the success of rice self-sufficiency from the New Order era*.

Liu, Y., Sun, D., Wang, H., Wang, X., Yu, G., & Zhao, X. (2020). An evaluation of China's agricultural green production: 1978–2017. *Journal of Cleaner Production, 243, 118483*. https://doi.org/10.1016/j.jclepro.2019.118483

Liu, D., Zhu, X., & Wang, Y. (2021). China's agricultural green total factor productivity based on carbon emission: an analysis of evolution trend and influencing factors. *Journal of Cleaner Production, 278, 123692*. https://doi.org/10.1016/j.jclepro.2020.123692

Mao, H., Zhou, L., Ying, R., & Pan, D. (2021). Time Preferences and green agricultural technology adoption: Field evidence from rice farmers in China. *Land use policy, 109, 105627*. https://doi.org/10.1016/j.landusepol.2021.105627

Mathis, R. L., & Jackson, J. H. (2019). *Human resources management: Essential perspectives (8th ed.)*.

McLennon, E., Dari, B., Jha, G., Sihi, D., & Kankarla, V. (2021). Regenerative agriculture and integrative permaculture for sustainable and technology driven global food production and security. *Agronomy Journal*, *113*(6), 4541-4559. https://doi.org/10.1002/agj2.20814

Nisar, Q. A., Haider, S., Ali, F., Jamshed, S., Ryu, K., & Gill, S. S. (2021). Green human resource management practices and environmental performance in Malaysian green hotels: The role of green intellectual capital and pro-environmental behavior. *Journal of cleaner production, 311, 127504*. https://doi.org/10.1016/j.jclepro.2021.127504

Noe, R. A., Hollenbeck, J. R., Gerhart, B., & Wright, P. M. (2020). *Fundamentals of human resource management (8th ed.)*.

Nyame-Asiamah, F., & Ghulam, S. (2020). The relationship between CSR activity and sales growth in the UK retailing sector. *Social Responsibility Journal*, *16*(3), 387-401. https://doi.org/10.1108/SRJ-09-2018-0245

Paillé, P., Valéau, P., & Renwick, D. W. (2020). Leveraging green human resource practices to achieve environmental sustainability. *Journal of cleaner production, 260, 121137*. https://doi.org/10.1016/j.jclepro.2020.121137

Pertiwi, N. (2024). *Implementasi pembangunan berkelanjutan di Indonesia*.

Rahdari, A., Sheehy, B., Khan, H. Z., Braendle, U., Rexhepi, G., & Sepasi, S. (2020). Exploring global retailers' corporate social responsibility performance. *Heliyon*, *6*(8). https://doi.org/10.1016/j.heliyon.2020.e04644

Rozaki, Z., Yudanto, R. S. B., Triyono, N., Alifah, S., Ardila, R. A., Pamungkas, H. W., ... & Man, N. (2024). Assessing the sustainability of organic rice farming in Central Java and Yogyakarta: An economic, ecological, and social evaluation. *Organic Farming*, *10*(2), 142-158. https://doi.org/10.56578/of100205

Rudnicki, R., Biczkowski, M., Wiśniewski, Ł., Wiśniewski, P., Bielski, S., & Marks-Bielska, R. (2023). Towards green agriculture and sustainable development: Pro-environmental activity of farms under the common agricultural policy. *Energies*, *16*(4), 1770. https://doi.org/10.3390/en16041770

Saleh, M., Heryadi, A. I., Kambali, L., Aspirani, A., & Abdullah, A. (2024). Peran Komunikasi dalam Kepemimpinan Efektif pada Organisasi Mahasiswa. *Jurnal Inspirasi Ilmu Manajemen*, *3*(1), 64-69. https://doi.org/10.32897/jiim.2024.3.1.3762

Sallnäs, U., & Björklund, M. (2020). Consumers' influence on the greening of distribution–exploring the communication between logistics service providers, e-tailers and consumers. *International Journal of Retail & Distribution Management*, *48*(11), 1177-1193. https://doi.org/10.1108/IJRDM-07-2019-0213

Schleper, M. C., Gold, S., Trautrims, A., & Baldock, D. (2021). Pandemic-induced knowledge gaps in operations and supply chain management: COVID-19's impacts on retailing. *International Journal of Operations & Production Management*, *41*(3), 193-205. https://doi.org/10.1108/IJOPM-12-2020-0837

Sujianto, Gunawan, E., Saptana, Syahyuti, Darwis, V., Ashari, ... & Marhendro. (2022). Farmers' perception, awareness, and constraints of organic rice farming in Indonesia. *Open Agriculture*, *7*(1), 284-299. https://doi.org/10.1515/opag-2022-0090

Turner, T., & Nguyen, H. (2020). Strengthening community-based training for sustainable agriculture: The role of local insights. *Journal of Agriculture and Food Research, 1, 100–109*. https://doi.org/10.1016/j.jafr.2020.100009

Ume, C., & Bahta, Y. T. (2024). Policy support strategies for organic farming extensification in Nigeria. *Organic Agriculture*, *14*(3), 323-344. https://doi.org/10.1007/s13165-024-00467-4

Wang, S., Cheah, J. H., Lim, W. M., Kumar, S., Lim, X. J., & Towers, N. (2024). Evolution and trends in retailing: insights from International Journal of Retail & Distribution Management. *International Journal of Retail & Distribution Management*, *52*(6), 647-670. https://doi.org/10.1108/IJRDM-10-2022-0377

Wang, Q., Gao, L., Li, Y., Shakoor, N., Sun, Y., Jiang, Y., ... & Zhang, P. (2023). Nano-agriculture and nitrogen cycling: Opportunities and challenges for sustainable farming. *Journal of Cleaner Production, 421, 138489*. https://doi.org/10.1016/j.jclepro.2023.138489

Wasahua, H. (2017). *Kepemimpinan dan manajemen sumber daya manusia [Leadership and human resource management]*. Ambon: IAIN Ambon Press.

Yanakittkul, P., & Aungvaravong, C. (2020). A model of farmers intentions towards organic farming: A case study on rice farming in Thailand. *Heliyon*, *6*(1). https://doi.org/10.1016/j.heliyon.2019.e03039

Zaim, H., Demir, A., & Budur, T. (2021). Ethical leadership, effectiveness and team performance: An Islamic perspective. *Middle East Journal of Management*, *8*(1), 42-66. https://doi.org/10.1504/MEJM.2021.111991

