

IMPACT SHEET: Low Carbon Rice Project

**Reducing Climate Impact of Rice Production in
Indonesia**



The project aims to reduce the climate impact of rice through the adoption of sustainable rice production practices and creation of enabling conditions for sustainable rice in Indonesia



PROJECT BACKGROUND

The “Low Carbon Rice: Reducing Climate Impact of Rice Production in Indonesia” project was implemented in Indonesia, specifically focusing on five key regencies within the provinces of Central and East Java: Klaten, Boyolali, Sragen, Ngawi, and Madiun. These locations are on Java, the “backbone” of national rice production, which provides approximately 53% of the country’s total output but remains vulnerable to climate change impacts like irregular rainfall and pests. The project was driven by the significant environmental footprint of rice cultivation, which accounts for 10% of global man-made greenhouse gas emissions due to methane from irrigated fields and the burning of rice straw. Additionally, the sector faces socio-economic challenges, as the majority of Indonesia’s 13.2 million rice-farming families are smallholders living near or below the poverty line with limited access to technology. High yield losses of 30% to 40% are also common among the nation’s 182,000 rice mills, most of which are small-scale operations with outdated equipment. Led by Preferred by Nature in collaboration with People Coalition and Food Sovereignty (KRKP) and Indonesia Rice Millers and Trader Association (Perpadi), the initiative addressed these issues by facilitating policy dialogue to recognize sustainable rice, establishing multi-stakeholder governance models, and improving access to finance for millers to upgrade technology and implement circular economy practices.

CHALLENGE

The “Low Carbon Rice” project addressed the multifaceted challenges of Indonesia’s rice sector, which is a significant contributor to emissions, responsible for 10% of global man-made greenhouse gas emissions through anaerobic methane production and the burning of rice straw. This environmental impact is coupled with the vulnerability of 13.2 million rice-farming families, 75% of whom are smallholders living near or below the poverty line with limited access to modern technology, markets, and finance to combat climate-induced threats like irregular rainfall and floods. Furthermore, the industry suffers from extreme industrial inefficiency, as the vast majority of Indonesia’s 182,000 rice mills utilize outdated equipment that results in staggering yield losses of 30% to 40%. These issues are underpinned by a lack of enabling policies and official market recognition for sustainable rice, which creates financial hesitation among millers and prevents the development of inclusive governance and stable, low-carbon supply chains.

PROJECT OBJECTIVES

The project’s key objective is to reduce the climate impacts of rice through the adoption of sustainable rice production. The specific objectives include:

- To develop enabling conditions and supporting policies for sustainable rice production through the facilitation of policy dialogue
- To develop a more inclusive sustainable rice sector governance model through multi-stakeholder facilitation

- To enhance market access opportunities for sustainable rice through facilitation of private sector engagement
- To expand access to finance opportunities for rice producers through technical assistance and new business models

TARGET GROUPS

- 150 small rice-millers for technical assistance and 25 medium to larger millers for business matching.
- 8 National level government entities, 33 Local Agency Office.
- 352 private sector from supply chain actors, HORECA, and major agri-tech corporations.
- 31 Individual farmer group, 8 farmers group association, 8 association, and 5 CSOs/NGOs.
- 10 Finance sector actors including state-owned and commercial banks, funding and regulatory agencies and international development finance.

PROJECT ACTIVITIES

Kickoff and Baseline Study

Beginning in 2022, the project launched inception workshops and district kick-off meetings across Java. Experts conducted a GHG baseline survey and a sustainable supply chain study. Technical teams organized Best Management Practices workshops and Training of Trainers sessions to strengthen milling practices and build local operational capacity.

Policy Advocacy and Institutional Governance

The project established district Task Forces and formed the SRP National Working Group in 2023 to coordinate sustainable rice initiatives. In 2024, the project submitted draft Regent Regulations (Ranperbup) to formalize miller protections and promote farmer–miller cooperation. The consortium developed SRP-based e-learning modules and assessed the feasibility of scaling SRP standards to one million hectares. By 2025, the team finalized the SRP Indonesia National Interpretation Guidelines and engaged in policy dialogues with Bappenas and the National Food Agency to strengthen national alignment.

Technical Revitalization, Market Integration and Global Knowledge Exchange

Small mills were supported to transition from diesel to electric power beginning in 2023. The project introduced the “Scan and Trust” digital traceability system and initiated a study on marketing low-carbon rice as “specialty rice.” In 2024, a “Social Night” in Semarang connected millers, farmers, and restaurants to strengthen market linkages. In 2025, featured a study visit to Vietnam’s Mekong Delta, a Team Europe visit involving EU ambassadors, the GHG endline study and two major knowledge events: the Forum on Indonesia Sustainable Rice and the International Sustainable Rice Forum.

LESSONS LEARNED

The project faced several implementation challenges stemming from conceptual gaps, policy transitions, regulatory constraints, market disruptions, and environmental shocks. Early in the project, the absence of a clear and widely accepted definition of “low carbon rice” created confusion and hesitation among stakeholders. This barrier slowed initial engagement and contributed to resistance from millers and local officials. The project addressed this through adaptive management—translating technical language into practical, profit-oriented solutions such as energy-efficient milling, operational improvements, and business-focused capacity building. By shifting the narrative from “carbon reduction” to “cost reduction,” stakeholders became more receptive. External environmental conditions further challenged implementation. The 2023–2024 El Niño event significantly disrupted planting cycles and reduced yields, creating upstream supply shortages and tightening competition within the rice market. Fragmented supply chains and volatility in raw material prices put additional pressure on production and distribution. At the same time, small millers continued to face difficulties accessing green financing, limiting their ability to invest in operational upgrades. The project responded by demonstrating the economic value of sustainable technologies, particularly mill electrification, which can reduce operational energy costs by up to 41%. Presenting sustainability as a pathway to cost savings and long-term market stability helped increase miller buy-in. The team also strengthened engagement with financial institutions to increase awareness of low-carbon investment opportunities for small millers.

A second major challenge was the political transition during Indonesia’s 2024 general election, which temporarily paused policy advocacy efforts as government ministries underwent restructuring. Key institutions, including the newly reformed Coordinating Ministry for Food Affairs, faced internal realignments that disrupted communication channels. To overcome this, the project proactively identified and engaged new focal points across ministries, restoring coordination and ensuring continued alignment with the government’s evolving priorities. Regulatory constraints also posed difficulties—particularly BAPANAS Regulation No. 2 of 2023, which set rice price ceilings that could affect the commercial viability of sustainably produced rice. To mitigate this, the project conducted strategic analysis and repositioned SRP-certified rice as “specialty rice,” a category eligible for premium pricing and exempt from standard price caps. This reframing enabled sustainable rice products to remain competitive within the regulatory landscape. Collectively, these challenges formed the basis for the project’s request for a 12-month no-cost extension, shifting completion to 31 December 2025. Through adaptive management, strategic reframing, and strengthened stakeholder coordination, the project successfully navigated systemic obstacles while maintaining progress toward long-term low-carbon transition goals.

The project demonstrated that engaging small rice mills is a powerful catalytic entry point for driving low-carbon transformation across the rice value chain, as integrated technical and market-based innovations at the mill level generate rapid economic and environmental returns. A key lesson is that transitioning from

diesel to electricity offers immediate value—reducing operational energy costs by up to 41% while significantly lowering GHG emissions—supported by strategic collaboration with PT PLN (Persero) to facilitate grid access and lay the groundwork for future renewable energy solutions such as solar power and biogas from agricultural waste. At the production level, sustained engagement with farmers remains essential, as practices like Alternate Wetting and Drying (AWD) and reduced chemical inputs serve as the primary drivers of emission reductions. Overall, formalizing farmer–miller partnerships through inclusive closed-loop business models, reinforced by continuous technical mentoring, ensures that low-carbon practices become self-sustaining systems that enhance climate resilience, improve operational efficiency, and strengthen livelihoods across the value chain.

PROJECT ACHIEVEMENT

- Built institutional foundations through SRP-NIG, e-learning, multi-stakeholder forums, and the SRP Working Group, supported by legal adoption in Boyolali and Klaten.
- Strengthened miller economics via electrification, closed-loop models, permits, and new revenue studies.
- Reduced GHGs by 20.8% through electrification, best management practices, and circular practices.
- Enabled strong collaboration across PbN, PERPADI, KRKP, PLN, banks, and national agencies.

LONG-TERM SUSTAINABILITY

The long-term sustainability of the Low Carbon Rice (LCR) project is reinforced by its alignment with Indonesia’s national low-carbon agenda and its integration into emerging financial mechanisms. By linking its work to the Low Carbon Development Initiative (LCDI) through the Indonesia Environmental Fund (BPD LH), the project secures a pathway for continued government prioritization and future budget support. Scaling is guided by strategic research, including the feasibility assessment to expand SRP implementation to one million hectares, with Boyolali positioned as a national model following the ratification of Regent Regulation No. 22/2025. Sustained economic viability is strengthened by the transition to electric mills, exploration of new revenue streams such as by-product utilization and voluntary carbon credits, and the strategic positioning of sustainable rice as “specialty rice” in the market.

Sustainability is further anchored in strong multi-sector partnerships and institutional arrangements. High-level commitments from Bappenas and the Coordinating Ministry for Food Affairs ensure the integration of sustainable rice targets into the RPJMN, while a formal network of 133 partners—including mills, farmer groups, universities, and district governments—provides the social and technical capital to operationalize a national sustainable rice model beyond 2025. Institutional continuity is secured through the establishment of the SRP Chapter Indonesia embryo and the multi-stakeholder forum, which will continue standard-setting and policy advocacy. By making all project resources Open Source, including bankable business plans and technical modules, the consortium ensures replication and uptake by new actors, enabling the sustainable rice transition to continue at scale.



Angga Maulana Yusuf
Preferred by Nature



This project has been a remarkable journey. We at Preferred by Nature have seen how quickly people can transform when they feel ownership, rather than a sense of obligation. The shift to electricity, better equipment, and new partnership mattered, but the biggest change came when millers, farmers, policy makers and consumers started to trust each other again. To carry this forward, we need stronger policies, markets, finance, and global support for scaling up Indonesia's success on its path to low carbon rice.



Project contributions to Climate Change Mitigation and SDGs

The project delivered substantial progress toward SDG 12 (Responsible Consumption and Production) by advancing multiple official UN targets across the rice value chain. In line with SDG 12.2 on sustainable resource management and 12.5 on waste reduction, the project strengthened the Material Footprint (12.2.1) through biomass maximization and circular-economy innovations. Rice straw and husk—traditionally burned or left to decompose—were transformed into valuable resources, supported by feasibility studies on husk pellets, wood pellets, and biochar production. By-products such as husk and bran were repurposed into organic fertilizer or livestock feed, contributing to a closed-loop system that reduces waste and lowers environmental impacts. The initiative also advanced the Food Loss Index (12.3.1a) by reducing post-harvest losses through machinery revitalization, electrification, and the introduction of “mini-lab” tools, increasing milling efficiency by 40% and reducing losses to 2%, contributing directly to SDG 12.3, which calls for reducing food loss along production and supply chains. The project's transition from diesel to electricity—67 mills completed and 14 in progress—aligned with SDG 12.c on rationalizing inefficient fossil-fuel subsidies by reducing fossil-fuel dependency at the mill level. Complementary improvements in waste handling support the spirit of SDG 12.4 on environmentally sound waste management, which requires reducing the release of harmful substances into air, water, and soil.

The project also embedded its technical advances within governance and market systems that strengthen long-term SDG alignment. Through the development of an E-learning platform, a business-plan template, the SRP National Interpretation Guideline, and the establishment of the National SRP Working Group, the initiative contributed to institutional capacities consistent with SDG 12.6, which encourages organizations to adopt sustainable practices and integrate sustainability reporting into their cycles. The formulation of five district-level policies supports future sustainable public procurement (SDG 12.7) by creating enabling regulation for low-carbon rice supply chains. Market linkages with Boemi Sorea, Depot Harmoni and Folcafe further advance sustainable consumption pathways under SDG 12.8 by expanding awareness and uptake of sustainably produced rice. National and international platforms—FISR 2025 and ISRF 2025—brought together government agencies, millers, farmer groups, civil society, and global experts, strengthening partnerships and knowledge sharing in line with SDG 12's call for collective action across sectors. The documented 20.8% reduction in GHG emission intensity, combined with feasibility studies to scale SRP practices to one million hectares and research positioning Low-Carbon Rice as a national specialty rice category, reinforces Indonesia's trajectory toward a circular, efficient, and low-emission rice sector—demonstrating strong alignment with global SDG 12 targets and principles.

The project leverages [SDG 12](#) (Responsible Consumption and Production) and [SDG 13](#) (Climate Action) as its central anchors, using sustainable production systems and GHG mitigation to drive progress across the wider SDG framework. By achieving measurable emissions reductions through mill electrification and climate-smart cultivation practices, the initiative contributes directly to [SDG 1](#) (No Poverty) and [SDG 2](#) (Zero Hunger) by increasing smallholder and miller incomes through premium product positioning and enhancing regional food security. Improvements in machinery revitalization, operational efficiency, and the transition from diesel to electric power reinforce [SDG 9](#) (Industry, Innovation, and Infrastructure) and [SDG 7](#) (Affordable and Clean Energy), laying the foundation for cleaner industrial processes. These advancements raise productivity and profitability among micro and small enterprises, strengthening [SDG 8](#) (Decent Work and Economic Growth) by building more competitive, resilient rural economies.

At the governance and social-development level, the project strengthens [SDG 17](#) (Partnerships for the Goals) through Multi-Stakeholder Forums (MSFs) that bring together government agencies, civil society, industry associations, and private-sector actors to collaboratively shape sustainable rice policies and markets. This inclusive model also advances [SDG 10](#) (Reduced Inequalities) by elevating the role of small-scale MSMEs within value chains traditionally dominated by larger industry players and supports [SDG 5](#) (Gender Equality) by enabling more women to take on strategic roles as facilitators, auditors, and enterprise managers. Furthermore, the development of SRP-based e-learning modules, capacity-building programs, and international knowledge exchanges strengthens [SDG 4](#) (Quality Education) by institutionalizing access to sustainability knowledge, technical expertise, and globally aligned training across the rice value chain—ensuring that the project's impact extends well beyond its implementation period.

Impacts at a Glance

Economic Impact	<ul style="list-style-type: none"> Mills consistently report significant efficiency gains. Sabar Makmur achieved a 14% efficiency increase, lowering daily costs from Rp 780,500 to Rp 668,000. Nindya Karya saw a 13% cost reduction, with operating costs dropping from Rp 374,080 to Rp 325,000 per day. A notable example was Muhadi of Bogo Food Miller in Boyolali which sold organic rice is projected to achieve a total profit growth of 8.24% over this five-year period following its revitalization. This steady growth contributes to the mill's high Return on Investment (ROI) of 283% and a quick Payback Period (BEP) of 1.3 years. This demonstrated the commercial viability and scalability of sustainable mill revitalization within the project. SMEs replaced old, inefficient machinery with modern equipment, such as bed dryers and bucket elevators. These upgrades improved processing efficiency by 40% and reduced grain losses to 2%.
Environmental Impact	<ul style="list-style-type: none"> Small rice mills (PPKs) were transitioned from high-emission diesel engines to electric-powered machinery connected to the grid, resulting in diesel fuel usage reduction of 226,946 to 58,403 liters year (from average of 40 small rice millers participated in the study). Transitioning to electricity eliminated substantial air and noise pollution hazards associated with traditional diesel-powered milling.
Social Impact	<ul style="list-style-type: none"> 35.3% of surveyed farmers reported a significant increase in their income after adopting project practices. Participating small rice mills (PPKs) reported improved profitability through a 41% reduction in energy costs after switching from diesel to electricity. Gender inclusivity was tracked across all project activities; recorded participation included 50 women rice millers, 128 women private sector actors, 26 women in government entities, 40 women in academia, and 2 women in media.
Climate Benefits	<ul style="list-style-type: none"> GHG emissions at the rice millers level reduced by 20.8% on average. Millers who fully switched to electricity reduced their diesel fuel consumption by 100%. Other Millers were able to reduce their consumption on average to 168,543 liters of diesel fuel per year, or approximately a 74.3% reduction after revitalization.
Green Finance	<ul style="list-style-type: none"> 40 small rice millers across the five project regencies benefitted from better access to finance. The project established connections with major international financial institutions, including the World Bank and the Dutch NGO SNV. SNV has expressed willingness to allocate grants and investment funds of up to more than 10 million EUR per applicant for those meeting specific climate and development criteria.
Target Group Engagement	<ul style="list-style-type: none"> Engaged 150 small rice millers, 743 stakeholders, and 500 event participants. Achieved 6,000 in-person stakeholder engagements and 18,000 virtual engagements, including webinars that garnered over 8,000 views. Implemented 25 public campaigns reaching over 12,000 people through radio talk shows, live public events, and social media outreach.
Policy Development	<ul style="list-style-type: none"> Successfully achieved the ratification of Regent Regulation (Perbub No. 22 of 2025) in Boyolali regarding Agricultural Business Partnerships and a similar regulation in Klaten (Perbub No. 64 of 2024) focused on the empowerment of agricultural actors. Developed and submitted five draft Regent Regulations (Ranperbup) across project districts, which are currently at various stages of legal review or provincial harmonization. Contributed to the inclusion of sustainable rice production goals within the Medium-Term National Development Plan (RPJMN) 2025–2029 and the Long-Term National Development Plan (RPJP) 2025–2045.
Europe-Asia cooperation	<ul style="list-style-type: none"> The project hosted a visit from four EU Members of the European Parliament (MEPs) in 2022 to showcase the green transition, followed by a monitoring visit from SWITCH-Asia Project Coordinator Guy Janaway in 2023. In June 2025, a "Team Europe" high-level visit involving EU Ambassadors took place across Central and East Java to evaluate the project's long-term progress.



FUNDING

EUR 2,680,847.04
(EU Contribution: 80%)



DURATION

Jan 2022 - Dec 2025



PARTNERS



Preferred by Nature



Koalisi Rakyat untuk Kedaulatan Pangan
(KRKP) – People's Coalition for Food
Sovereignty



Perkumpulan Penggilingan Padi dan
Pengusaha Beras Indonesia (PERPADI) –
Indonesia Rice Millers and Traders Association



CONTACT

Angga Maulana Yusuf
Preferred by Nature Bogor Office
Jl. Sempur Kaler No.3, RT.01/RW.02, Sempur, Kecamatan
Bogor Tengah, Kota Bogor, Jawa Barat 16129 Indonesia
Telephone: +62 813-6697-9677
Email: amaulana@preferredbynature.org
Website: bit.ly/low-carbon-rice



www.switch-asia.eu



EU SWITCH-Asia Programme
@EUSWITCHAsia



SWITCH-Asia
@SWITCHAsia



SWITCH-Asia Official
@switch-asia-official

This impact sheet is developed together with SWITCH-Asia Policy Support Component