



INDONESIA DOMESTIC BIOGAS PROGRAM ANNUAL REPORT 2023

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Executive Summary

The Indonesia Domestic Biogas Program (IDBP) is a multi-stakeholders program aimed to accelerate the facilitation of access for renewable energy among grassroots community through household-scale biodigesters technology using market approach and circular economy model. In 2023, IDBP achieved several milestones, expanding its reach to 20 provinces across Indonesia and installing 29,434 biodigesters. These installations have directly benefited 135,730 household members, providing them with alternative clean energy for cooking. East Java remains with the highest cumulative number of biodigesters, while the highest number of constructions in 2023 occurred in West Nusa Tenggara, with a total of 280 biodigesters built. A total of 571 biogas digesters installed in 2023 support in creation of 25 jobs in the biogas supply chain, including construction of bio-biodigester and the production of biogas appliances.

To further strengthen the biogas ecosystem in 2023, YRE has implemented several strategic initiatives, including enhancing access to climate finance through green cooperatives, promoting gender equality in renewable energy, and fostering collaborative partnerships with various stakeholders. As IDBP moves forward, it faces several challenges, such as navigating the evolving regulatory landscape for carbon trading and biogas development. Additionally, scaling up the value chains for biogas and bio-slurry, and fostering international collaborations to drive innovation and capacity building, are crucial for the program's long-term success. By addressing these challenges and capitalizing on emerging opportunities, IDBP is poised to continue its transformative journey, empowering communities, and contributing to a sustainable future for Indonesia.

Abbreviations

ASS	After Sales Service
Bappeda	<i>Badan Perencanaan Pembangunan Daerah</i> (Local Planning and Development Agency)
BIRU	Biogas <i>Rumah</i> (Domestic Biogas)
BUS	Biogas User Survey
CME	Coordinating/Managing Entity
CPO	Construction Partner Organization
CSR	Corporate Social Responsibility
CU	Credit Union
DGNREEC	Directorate General of New, Renewable Energy and Energy Conservation
DPMPD	<i>Dinas Pemberdayaan Masyarakat, Pemerintahan Desa, Kependudukan dan Catatan Sipil</i> (Department of Community Empowerment and Village Government and Population)
FCF	Fair Climate Fund
FGD	Focus Group Discussion
HBC	HIVOS Biogas Consortium
HIVOS	Humanist Institute for Cooperation with Developing Countries
IDBP	Indonesia Domestic Biogas Program
IDR	Indonesian Rupiah
LPG	Liquefied Petroleum Gas
LPDB	<i>Lembaga Pengelolaan Dana Bergulir</i> (Revolving Fund Management Institute)
MEMR	Ministry of Energy and Mineral Resources
MFI	Micro Finance Institutions
MOEF	Ministry of Environment and Forestry
PE	Polyethylene
RBF	Rabobank Foundation
RPJMD	<i>Rencana Pembangunan Daerah Jangka Menengah-Daerah</i>
SDG	Sustainable Development Goal
SSBC	South-South Biogas Community
VPA	Voluntary Project Activity
YRE	<i>Yayasan Rumah Energi</i> (Rumah Energi Foundation)
YSEALI	Young Southeast Asian Leaders Initiative

IDBP in Numbers

Number of Digester in Years

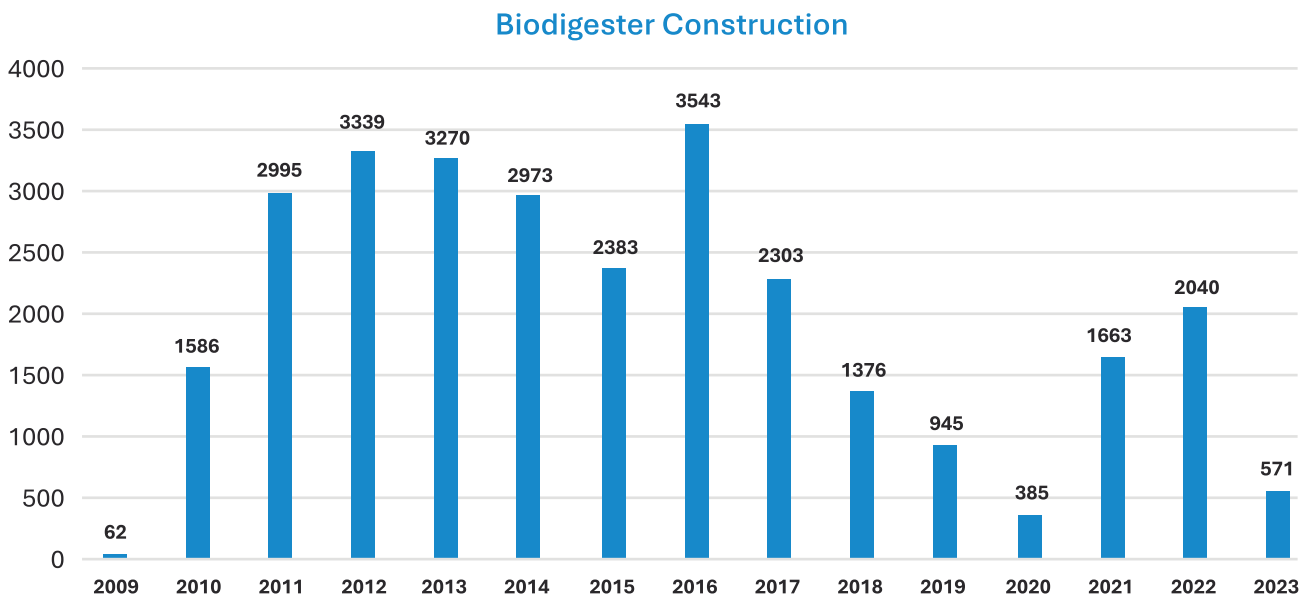


Figure 1. Biodigester Construction 2009-2023

Number of People with Access to Clean Cooking Energy

People with access to clean energy cooking 135,730 people have gained access to clean energy for cooking resulting from the construction of 29,434 units of digesters. In 2023 alone, there are 2,263 people who have gained access to clean energy for cooking from 571 units of digesters.

Number of Digester per Provinces

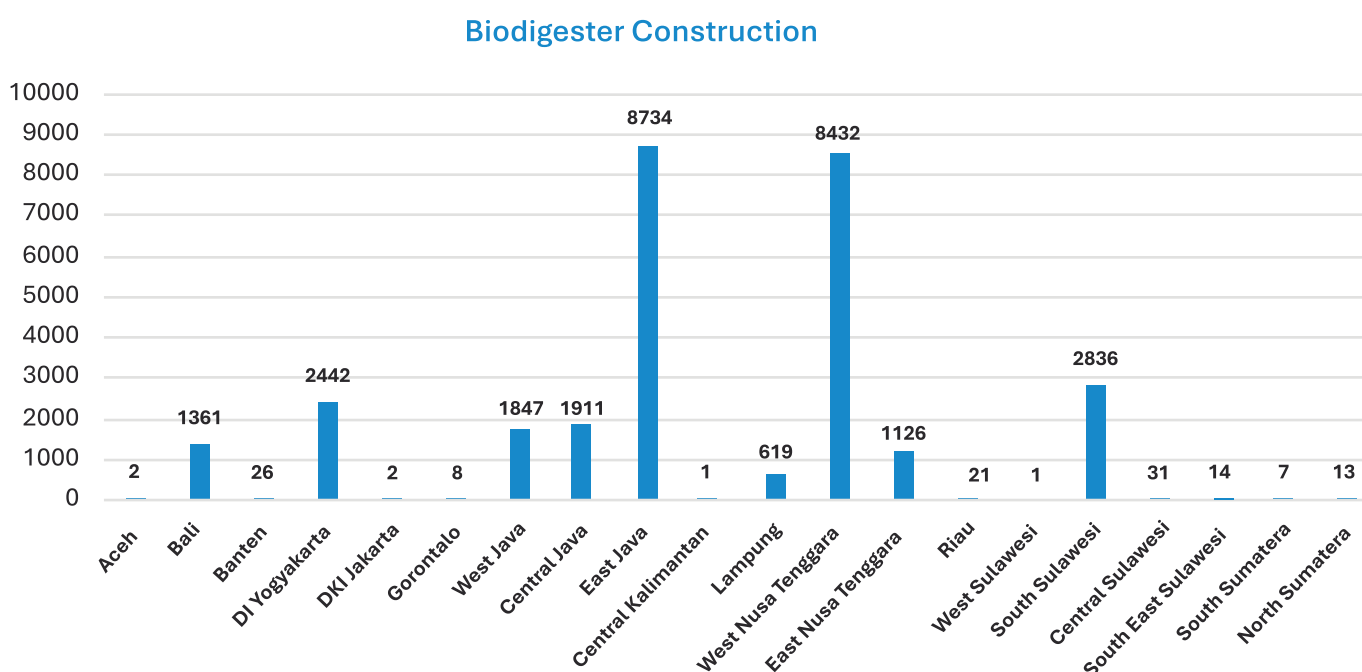


Figure 2. Total Biodigester Installed per Province Cumulatively

Biodigester Installed 2023

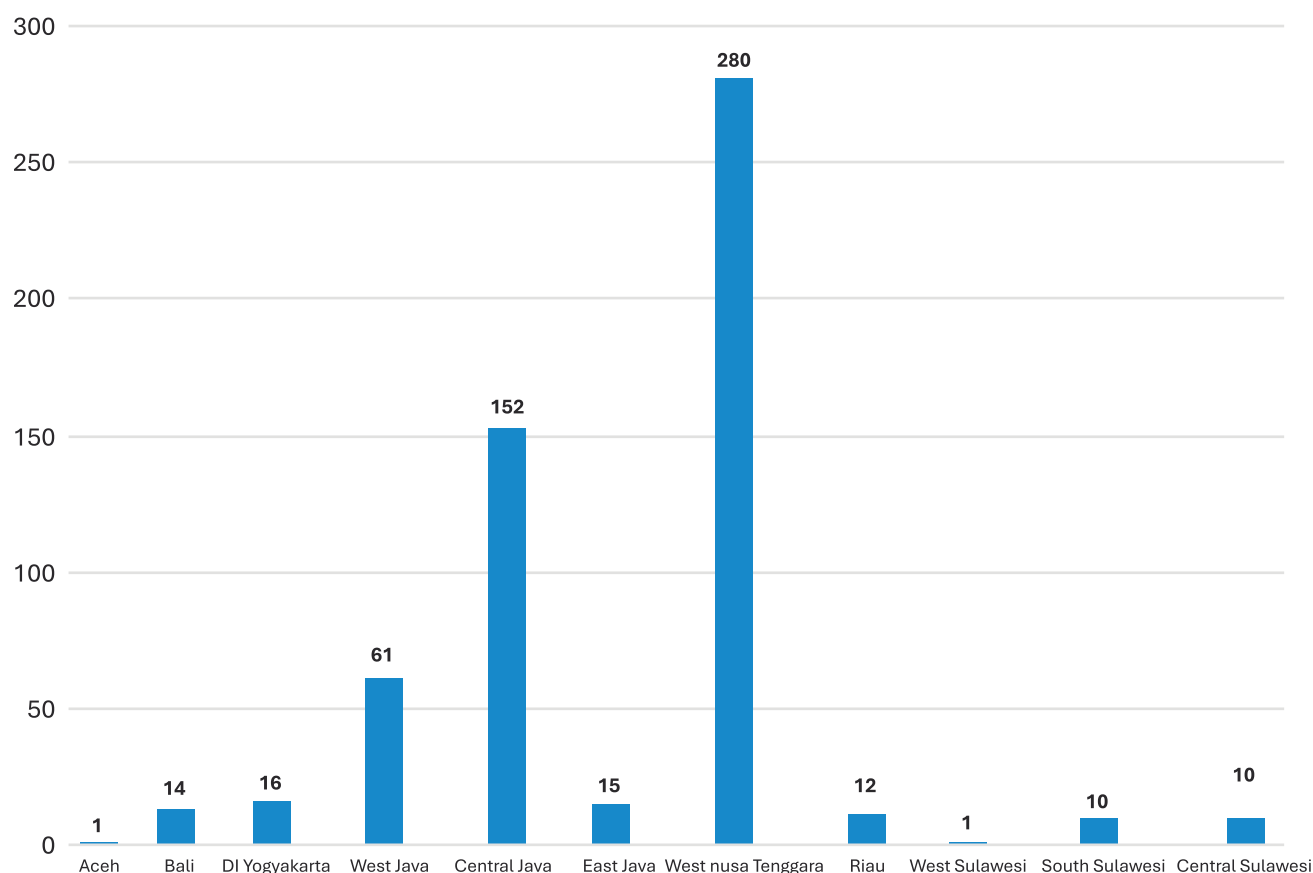


Figure 3. Biodigester Installed per Province in 2023

The province of East Java remains with the highest cumulative number of biodigesters, despite only 15 new units built in 2023 by three CPOs: CV Mitra Bumi Abadi, KAN Jabung, and KPSP Setia Kawan. The demand for biogas has been impacted by the ongoing cattle foot-and-mouth disease outbreak, affecting manure availability.

The highest number of constructions in 2023 occurred in the province of West Nusa Tenggara, with a total of 280 biodigesters built. Nearly all were funded through community self-funding, with residents contributing personal funds for household biodigesters. The leading CPO in this province was Datu Sakti MG, responsible for 145 of these units. Additionally, one 4m³ biogas unit was built through a mixed financing scheme involving government funds, built by Sangkareang MG. This demonstrates that village funds can be leveraged for biogas projects, supporting waste management and renewable energy at the village level.

Biogas development expanded to West Sulawesi for the first time in 2023, where CPO CV Rezky Masagena Utama facilitated a biodigester project in Rea Village, Polewali Mandar Regency, with support from the local agriculture and food agency (see Figure 4). Aceh also saw growth, adding one more biodigester, bringing the total there to two, with the latest unit constructed by CPO Ujung Berung MG.



Figure 4. The first Biodigester in West Sulawesi

Number of Digester per Size

Digester Installed per Province and Size in 2009-2023

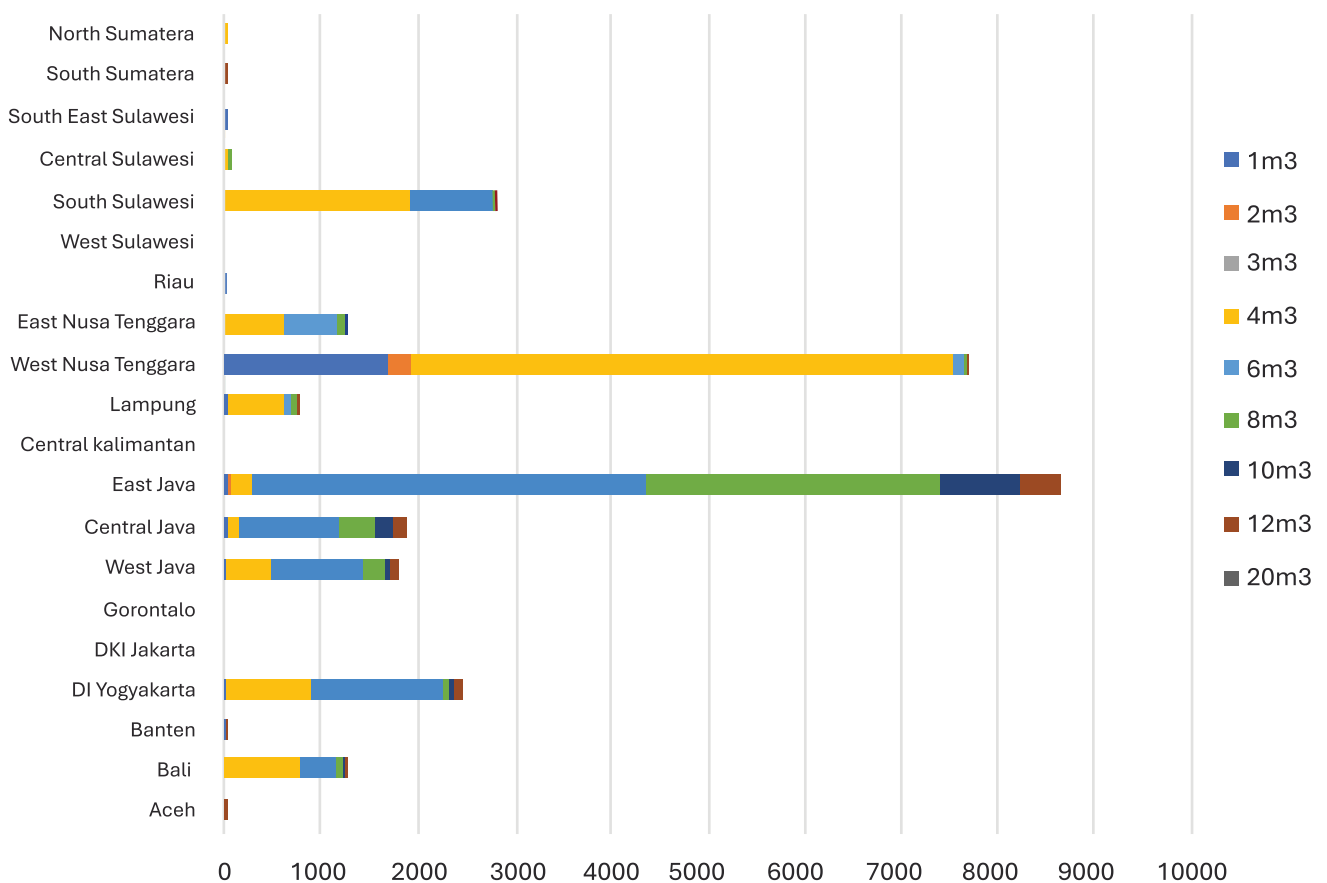


Figure 5. Total Biodigester Installed per Province and Size

Digester Installed per Province and Size in 2023

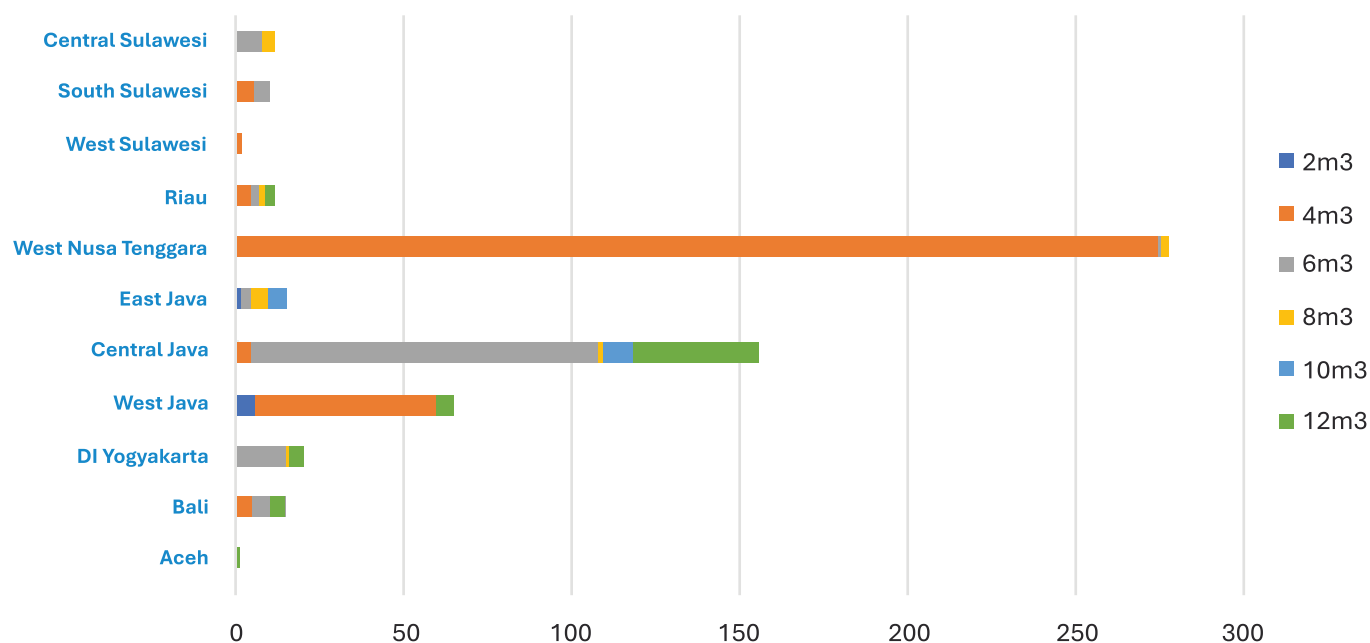


Figure 6. Digester Installed per Province and Size in 2023

The most common size of biogas digester built in 2023 was 4m³ (shown in orange in Figure 6.) totaling 346 units. Following the initial trend of the IDBP, West Nusa Tenggara remains the leading province with 6,280 units of 4m³ biogas digesters cumulatively since 2009. In 2023, Central Java was the highest construction of 12m³ biogas digester, with 28-units digester installed, 57% of which were built by CPO CV Delta Cipta Sentosa (see Figure 6). West Java also dominated by 4 m³ biogas size. Almost all biogas digesters built in 2023 used the fixed dome concrete type. BioMiru had only one development in 2023, which was built by CPO Ujung Berung MG in Depok City, West Java. This digester has a size of 6 m³ and uses waste input from beef cattle. Factors that determine the size of a biogas system include the number of livestock, the amount of daily organic waste, the available land for biogas construction, the digester technology, and the energy needs for cooking or other purposes.



Figure 7. BioMiru Digester Installation in Urban Area, Depok, 2023

Funding Sources for Digester Installation

Biodigester Installations Funding Source in 2023

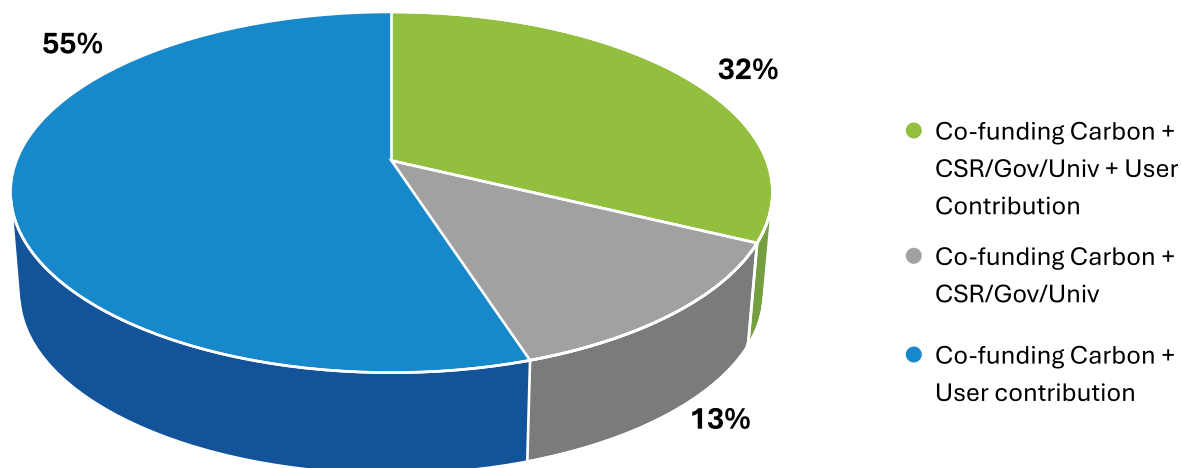


Figure 8. Distribution of Digester Installation based on Funding Scheme in 2023

As shown in the funding source graph above, biodigesters construction in 2023 was largely driven by community self-funding, continuing the trend from the previous year (88% in 2022). However, there has been a notable increase in construction funded through cost-sharing scheme, which involves YRE carbon funds, user contributions, and third-party support, along with the co-funding with third parties compared to last year. This shift reflects a growing public awareness and stakeholder whether government, community, university, and company commitment to the environmental benefits of biodigesters construction and development.

Distribution on Company and Institutions Co-Funding Biogas in 2023

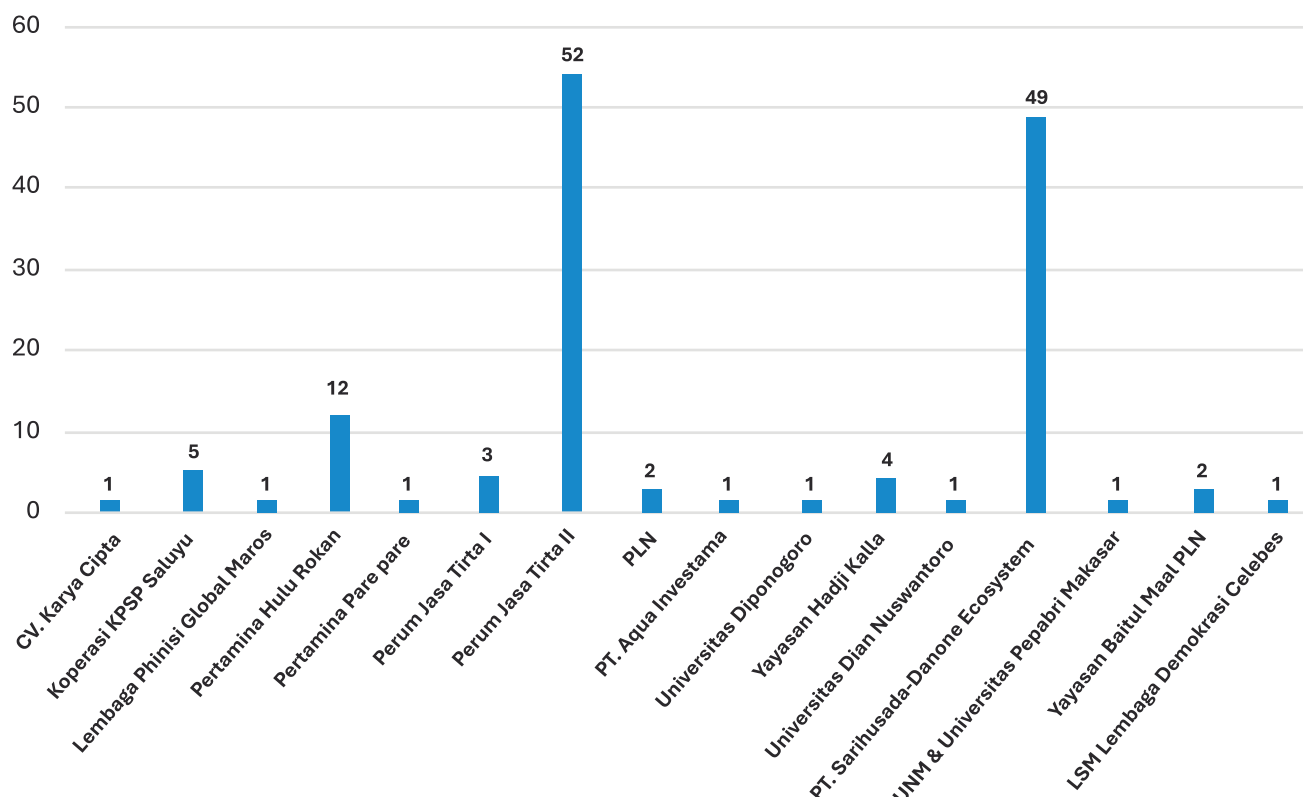


Figure 9. Distribution of Biodigester Installation Co-Funded by Company and Institutions in 2023

In total, 17 institutions and companies were recorded as providing additional financial subsidies for biogas development in 2023. Perum Jasa Tirta II (PJT II) is the company that provided the most subsidies and developed biogas through mixed financing, even surpassing the 45 units of PJT II biogas developments in 2022. Apart from PJT II, there are several institutions that have been providing funding subsidies for biogas development since 2022, such as the Celebes Democracy Institute, Pertamina Hulu Rokan, the Hadji Kalla Foundation, and Perum Jasa Tirta I.

Biogas development at Pertamina Hulu Rokan continues through the Energy Independent Village (DEB) program, where the potential for organic waste in Muktisari Village, Riau Province, remains. Potential organic waste sources include tofu waste, goat/sheep waste, and human waste. PT Sarihusada – Danone Ecosystem, a national dairy company is the second-largest provider of subsidies for biogas development, with 49 units in 2023. YRE and PT Sarihusada – Danone Ecosystem are collaborating on the Local Milk Sourcing (LMS) program to improve the quality and quantity of dairy cow milk, using biogas as a waste management solution to ensure clean pens for farmers and livestock. Subsidy funds for biogas development from academic institutions or universities also continued in 2023, with contributions from Diponegoro University and Makassar State University - Pepabri University Makassar. These academic institutions not only provided funding subsidies for biogas development but also conducted training on processing organic fertilizer from bioslurry, in collaboration with CPO as a partner.

(<https://unm.ac.id/2023/11/22/unm-kerja-dan-tim-kosabangsa-universitas-pepabri-makassar-ad-akan-pelatihan-pengolahan-pupuk-organik/>)

Trend of Digester Installation based on Funding Scheme in 2009 - 2023

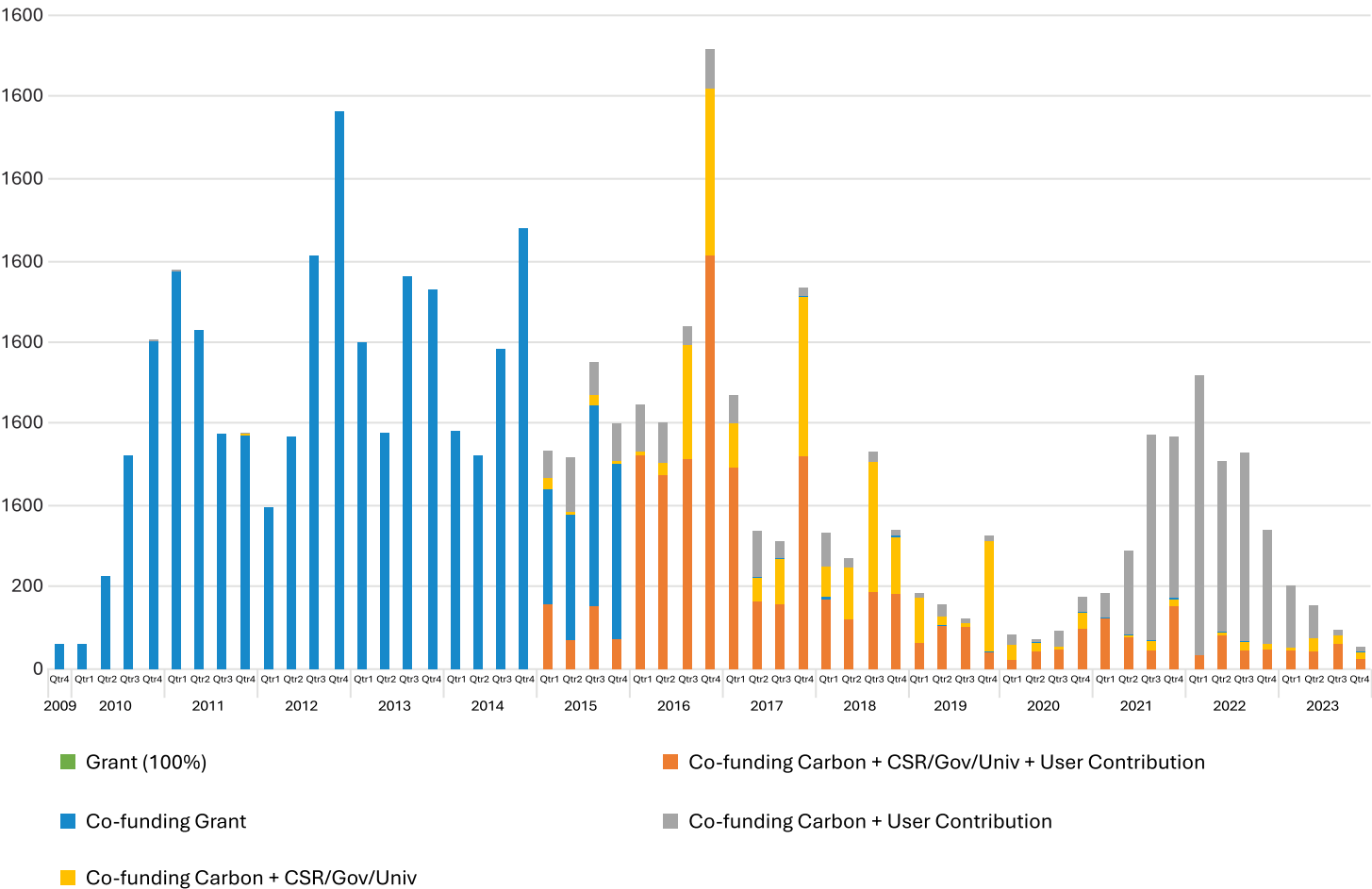


Figure 10. Trend of Digester Installation based on Funding Scheme in 2009 – 2023

This bar trend graph shows the yearly distribution of biodigester construction across different funding sources from 2009 to 2023. The blue bars represent projects fully funded by YRE’s carbon funds, which dominated the early years until around 2015, after which their prevalence declined. Starting in 2016, the orange bars (community self-funding) increased significantly, peaking around 2017, showing a shift towards self-initiative in biodigester development.

From 2018 onward, there is more diversity in funding sources, with an increase in mixed or cost-sharing schemes represented by yellow and grey bars. This shift indicates growing collaboration and co-funding efforts involving third parties, government grants, and community contributions. The trend suggests a broadening awareness and investment in renewable energy, with a transition from single-source to multi-source funding.

Notes:

Grant (100%) is for biodigester installation with whole funds coming from YRE donor/grant funds without subsidies from other parties.
Co-funding Grant is for biodigester installation with co-financing between grant fund from donors and other funding such as company’s CSR, academicians, household/user, carbon subsidy fund (after Gold Standard certification and carbon credit trading), and the government.
Co-funding Carbon + CSR/Gov/Univ + User Contribution is for biodigester installation with co-financing between YRE carbon subsidy fund, company’s CSR, government funds, or academic funds, and household/user fund.
Co-funding Carbon + User Contribution is for biodigester installation with co-financing scheme between YRE carbon subsidy funds and household/users' fund only.
Co-funding Carbon + CSR/Gov/Univ is for biodigester installation with co-financing scheme between YRE carbon subsidy funds with company CSR funds, government funds, or academic funds without household/users’ fund.

Quality Inspection and After Sales Services

Table 1. Quality Inspection and After Sales Services 2009 – 2023

Year	Number of digester built in year	Total of Digester in year	Total of Digester Quality Check	Completed ASS1	Completed AS2	Total of After Sales Service Check
2009	62	62	62	62	62	62
2010	1,586	1,648	1,648	1,586	1,586	1,648
2011	2,995	4,643	4,631	2,983	2,983	4,631
2012	3,339	7,982	7,911	3,280	3,280	7,911
2013	3,270	11,252	11,128	3,217	3,217	11,128
2014	2,973	14,225	14,006	2,878	2,878	14,006
2015	2,383	16,608	16,191	2,185	2,185	16,191
2016	3,543	20,151	18,840	2,649	2,649	18,840
2017	2,303	22,454	20,428	1,844	1,588	20,684
2018	1,376	23,830	22,363	1,167	775	21,851
2019	945	24,775	22,775	652	315	22,503
2020	385	25,160	23,043	208	3	22,711
2021	1,663	26,823	23,774	565	0	23,276
2022	2,040	28,863	24,912	1001	214	24,491
2023	571	29,434	25,057	1824	925	27,240

Job Creation

The biogas sector has considerable contribution in the absorption of labor. In 2023, a total of 571 biogas digesters have been built and there are 25 jobs created from the biogas supply chain, including construction of bio-biodigester and the production of biogas appliances (e.g. stove, gas pipe, and manometer production). The workers have received training from IDBP on biogas installation in accordance with IDBP standards.

Work Area in 2023

Operation Map of IDBP in 2023

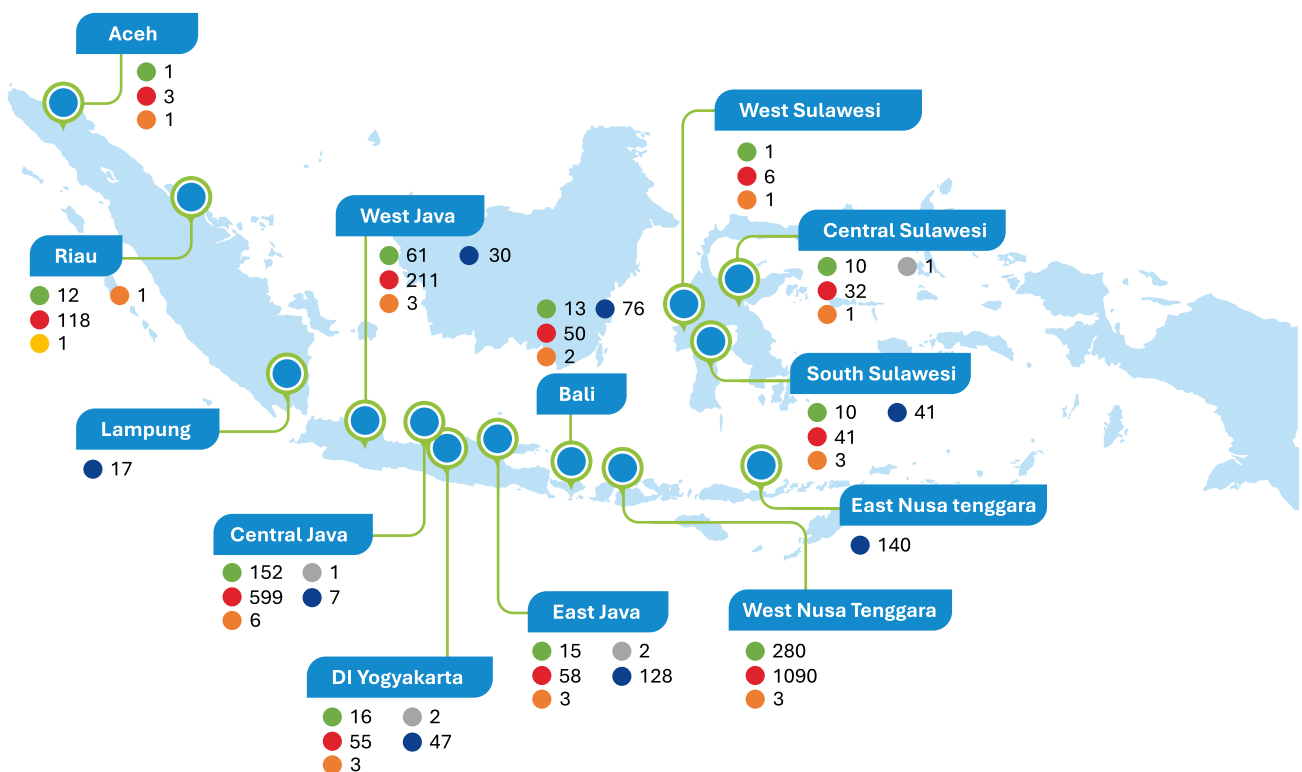


Figure 11. IDBP Operation Map in 2023

Legend:

● Total Biogas Built	● Construction Partner Involved
● Total household beneficiaries	● Cooperation Partner (as CPO or loan lender)
● Business incubation	● Total Biogas User Training

Social Business Incubation

One biogas and bioslurry based business unit was incubated from the "Biogas-Based Independent Energy Village" or often called by Desa Energi Berdikari (DEB) Program in collaboration with YRE and Pertamina Hulu Rokan (PHR). A total of 20 biogas users in Muktisari Village, Tapung District, Kampar Regency, Riau Province were formed into a group for the business of liquid organic fertilizer and solid organic fertilizer with raw materials from bioslurry called the Biotama Agung Lestari Group. They received training about group management, fertilizer technical process, accounting, and marketing training.



Figure 12. Mr Hadi, One of the DEB Program beneficiaries holding the group fertilizer product

Involvement Cooperatives as Loan Partner

Table 2. Cooperatives Loan Database in 2023

Cooperation	Total Biogas built using loan in 2023	Total Loan
CU Wita Mori	10	Rp 166,500,000
KUJB Puspetasari	36	Rp 72,000,000
KPSP SETIA KAWAN	3	Rp 23,432,000

Cooperatives are one of the tools used by IDBP to promote biogas development in Indonesia. They can provide funding access to potential biogas users who lack sufficient funds to install biogas systems at home. Loan or credit schemes offer a solution to this issue. In 2023, biogas development through loan schemes reached a total of 49 biogas units. Three cooperatives provided loan funds for biogas development in 2023: CU Wita Mori, KUJB Puspetasari, and KPSP Setia Kawan. Both KUJB Puspetasari and KPSP Setia Kawan are long-standing partners in biogas development. KUJB Puspetasari offered an additional loan funding subsidy of Rp. 2,000,000 per biogas unit and is a beneficiary of the LMS program in Central Java. KPSP Setia Kawan has been building biogas units and providing loans since 2009 when IDBP began. The loans provided by KPSP Setia Kawan for three 8 m³ biogas units in East Java amounted to approximately 7 to 8 million Rupiah. CU Wita Mori is a newcomer Cooperative in IDBP.

CU Wita Mori is a Credit Union in Central Sulawesi Province. They built 10 biodigester in North Morowali and Poso District with loan from 16 – 20 million Rupiah per unit to customer. It is hoped that more cooperatives will be willing to provide funding for biodigester development in the community through loans or subsidies, ensuring the sustainability of the biogas market in Indonesia.

Bioslurry Utilization in Household

According to the 2023 ASS database, the number of households utilizing bioslurry is 1,098 out of 2,749 biogas households surveyed by CPO. West Nusa Tenggara is the province with the highest number of bioslurry users, totaling 1,007 households meanwhile in Bali, there are 14 households using bioslurry; in West Java, there are 4 households; in Central Java, there are 21 households; in East Java, there are 18 households; in Riau, there are 7 households; in South Sulawesi, there are 10 households; in Central Sulawesi, there are 3 households; in Southeast Sulawesi, there are 13 households; and in South Sumatra, there is one household using bioslurry. Bioslurry also come in liquid and solid form. Here is a pie chart showing the number of bioslurry users based on its forms:

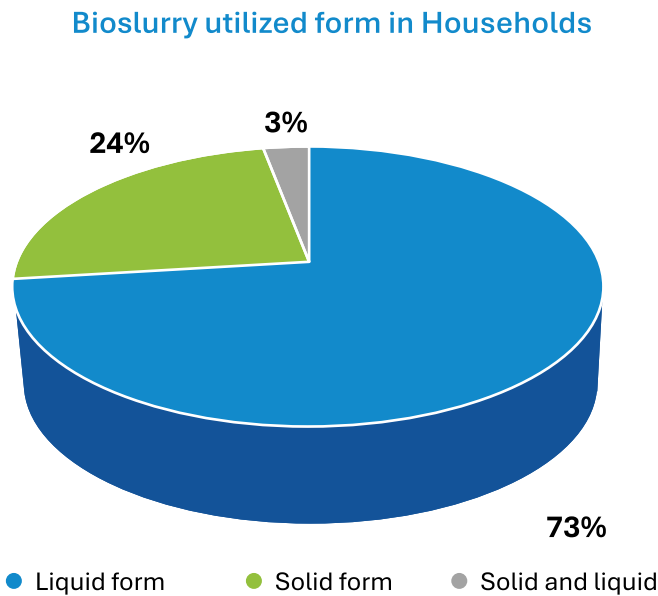


Figure 13. Bioslurry Utulization in Household

The effects of bio-slurry on crop production vary depending on the type and condition of the soil, seed quality, climate, and other factors. However, in general, the use of bio-slurry provides the following benefits:

- Improves the physical structure of the soil, making it more friable.
- Increases the soil's ability to retain water for longer periods, which is beneficial during the dry season.
- Enhances soil fertility, making the soil more nutrient-rich and well-balanced.
- Boosts the activity of earthworms and "pro-biotic" microbes in the soil, which are beneficial for both the soil and plants.

When stored and used properly, bio-slurry can improve soil fertility and increase crop yields by an average of 10-30% compared to regular manure. Households using bioslurry are divided into four categories: those using it for fertilizer, those using it for compost, those using it for both fertilizer and compost, and those using it for fish pellet feed. Here are the details regarding the number of beneficiaries in each category of bioslurry users.

Table 3. Households that Utilize Bioslurry in 2023

Utilization of Bioslurry	Total Bioslurry Users in 2023
Compositing Utilization	5
Fertilization	1037
Fertilization and Composting Utilization	19
Fish Pellet Utilization	1

Biogas Ecosystem Strengthening

Enhancing Access to Climate Finance with Green Cooperative Program

Strengthening access to financing for local communities is a key focus for YRE. Over the past 12 years, cooperatives involved in the Indonesia Domestic Biogas Programme (IDBP) have shown that they can effectively mobilize climate mitigation funds, especially in rural areas. By the end of 2023, cooperatives serving as CPOs have helped build 6,429 biogas units. Additionally, 61 cooperatives have provided low-interest loans to biogas users, using funds from their own resources, grants, and revolving loans from other financial institutions. Reflecting on its efforts to improve local communities' access to climate financing, YRE launched the Green Cooperative Program to address the link between renewable energy and financing. The program aims to empower and enhance an enabling condition for local Indonesian cooperatives to become agents of change in the shared global challenge of climate mitigation and adaptation financing. In 2023, YRE implemented several projects, focusing on policy advocacy workstream and climate finance workstream in both adaptation and mitigation efforts.

On the policy and advocacy side, YRE conducted a baseline study to assess how ready cooperatives are and to review current regulations that could support mobilizing climate finance through cooperatives. A policy paper was published at the end of 2023 with recommendations for the Ministry of Cooperatives and Small Medium Enterprises (MoCSMEs). It focused on building an ecosystem where cooperatives engage in environmentally friendly businesses and offer services based on climate risks within their work area, including financing for innovations like biogas technology and Solar PV (see here: <https://www.rumahenergi.org/wp-content/uploads/2024/03/Buku-Analisis-Kebijakan-YRE.pdf>). Additionally, YRE developed operational guidelines to help cooperatives transition into Green Cooperatives (see here: <https://www.rumahenergi.org/wp-content/uploads/2024/03/Buku-Pedoman-Operasional-YRE.pdf>).

The Green Cooperative Adaptation Readiness (GENCAR) Project, part of the Green Cooperative Program's adaptation workstream, provided business coaching and capacity building for four cooperatives in Central Java. A key finding from GENCAR was that cooperatives should be strengthened to empower the groups they support to become green business actors or environmentally focused cooperatives, following a multi-party cooperative model.



Figure 14. KJUB Puspetasari

This transition will serve as a valuable case study, showcasing approaches for developing climate-adaptive businesses and fostering a low-carbon economy. Another project, the Local Milk Sourcing (LMS) Project, implemented by YRE in Central Java, Yogyakarta, and East Java, helps channel funds from a national dairy company to small-scale dairy farmers through cooperatives. This is done using a grant and revolving fund scheme to provide loans. By working more deeply in financing programs, YRE aims to scale up climate financing, especially for the development of the Indonesia Domestic Biogas Programme (IDBP) and biogas in Indonesia in the future.

The Importance of Gender Mainstreaming in Renewable Energy

Prowomen for Renewable Energy

YRE promotes women's empowerment and gender equality by ensuring equal access to resources and material benefits, which helps improve women's socioeconomic status. It also emphasizes providing non-material benefits, such as participation in training programs, to enhance women's skills, self-expression, and self-esteem. To encourage women's involvement in decision-making, both partners in a household must sign agreements for the construction of an IDBP biogas unit. Men and women are given equal opportunities to join bio-slurry management training, learn biogas operation and maintenance, and access microfinance. Women also have the chance to generate additional income by using biogas and bio-slurry in their daily activities.



Figure 15. Learning Event of Pro Women for Renewable Energy in Mataram, West Nusa Tenggara

In 2023, YRE, with support from the Ford Foundation and PT Insight Investments Indonesia, implemented the "Prowomen for Renewable Energy" project in West Nusa Tenggara. The project engaged 108 beneficiaries, including 23 members of Women Farmers Groups (KWT), 15 coffee farmers, 12 women entrepreneurs, 22 youth, 4 cooperative institutions, and 30 representatives from village and district governments in Central Lombok, West Nusa Tenggara Province, as well as the Directorate General of Regional Development of the Ministry of Home Affairs. These participants gained valuable experience in gender equality, represented their communities in empowering others, and accessed economic opportunities within the renewable energy value chain. There are 4 main strategies within the gender mainstreaming framework that the project used, which are:

1. **Access:** Ensuring that vulnerable groups (women, youth, people with disabilities, and the elderly) have access to information and education about renewable energy is essential. For example, accessible information is provided to reach these groups, and education or training is offered to help them understand or take the initiative in exploring alternative technologies related to renewable energy.
2. **Participation:** Promoting vulnerable groups to have knowledge and involvement in development activities, including planning, implementation, monitoring, and evaluation of renewable energy projects for their communities. For instance, full involvement in decision-making during Village Development Planning meetings (e.g.: Musrenbang Desa and Musdes). They also have opportunities to participate in discovering new energy sources or working in related sectors.

3. **Control:** Vulnerable groups are empowered to make decisions about renewable energy use and resource allocation. For example, they can choose for themselves whether to use solar power, biogas, or other energy sources.
4. **Benefits:** Ensuring that vulnerable groups directly or indirectly get benefit from renewable energy programs. For example, they may receive subsidies to purchase or build renewable energy systems. Additionally, renewable energy programs may offer employment or educational support to these groups, helping them become more empowered in the sector.

Equipping Women Organization for a Just Energy Transition Financing Seminar

Amid growing discussions in the public sphere about financing energy transition and renewable energy initiatives, YRE had the opportunity to participate in a workshop aimed at strengthening the role of women's organizations in advocating for just energy transition financing. The workshop was organized by Oxfam and targeted various NGOs working on women's issues, women's empowerment, and vulnerable groups. This was part of an effort to educate and bridging access for women groups to the just energy transition and its funding sources opportunity. Several participants stated that just energy- transition and renewable energy issue was something new for them and the forum has opened- opportunities to help equip their women's group beneficiaries with education & information that is relevant to the needs of tackling climate change risks.

YRE shared the panel with PT PLN (state-owned electricity company), Environmental Fund Management Agency (BPDH), Indonesian Renewable Energy Cooperative (KOPETINDO), and Institute of Essential Services Reform (IESR). In this forum, YRE highlighted best practices from renewable energy initiatives at the local level, particularly through biogas program and the financing schemes that have been implemented. One of the key takeaways from the discussion was the importance of YRE's role as an ecosystem enabler, which facilitates the creation of a market-oriented ecosystem with a circular economy approach through renewable energy utilization that not only benefits the environment but also has positive social, economic, and health impacts. Collaboration and networking to access innovative funding sources are also crucial to creating an inclusive climate finance ecosystem that meets the needs and potential of communities at the grassroots level.



Figure 16. YRE and Panelists in Just Transition Financing Seminar for Women Organization

Stakeholder Engagement & Collaborative Work

Technical Agreement between YRE and Central Java Province Energy and Mineral Resources Agency

In July 2023, YRE and Central Java Province Energy and Mineral Resources Agency signed a technical agreement on renewable energy development cooperation through biogas technology. The agreement's purpose was to build cooperation in local planning and implementation of biogas and enhancing human resource's capacity regarding technical development and acceleration of renewable energy through biogas in Central Java Province. This cooperation was underlined by the long-standing relationship between both parties since IDBP Program first penetrated to the area in 2009. Throughout the year 2023, YRE has been formally involved in Central Java Energy and Mineral Resources Agency's educational and capacity building activities such as accompaniment to the Agency energy extension workers which aimed to promote potential exploration and community empowerment through biogas programs, thereby stimulating a greater role for communities and village governments in the energy transition. Biogas socialization to village government and grassroot communities to advance the energy independent village or *Desa Mandiri Energi* initiatives through renewable energy development and village-level energy transition is also being done in October 2023. The *Desa Mandiri Energi* was then competed between villages in Central Java to examine the governance, funding, and renewable energy innovation carried out by the village. YRE became one of the team judges representing elements of renewable energy practitioners.



Figure 17. Desa Mandiri Energi for Village-level Energy Transition Socialization in Semarang Regency

Desa Energi Berdikari (DEB) Program in Riau

In partnership with PT Pertamina Hulu Rokan – WK Rokan (PT PHR), YRE supported the energy transition and community groups empowerment in Kampar Regency and Pekanbaru City, Riau Province. The "Biogas-Based Independent Energy Village" or often called by *Desa Energi Berdikari* (DEB) aims to improve community welfare through implementation of biogas as renewable energy technology. The program was formerly implemented in 2022 with main activities among others are biogas units' installation and biogas & bio slurry training. The positive acceptance from local stakeholders and successful implementation has led to the second phase of program implementation in 2023. To scale up the second phase implementation, the project focuses on building and enhancing circular economy practices through capacity building in developing local biogas market and institutional strengthening for beneficiaries' group.

A total of 21 biogas units and 2 integrated bioslurry demoplots for agriculture and catfish cultivation were built in Muktisari Village and Palas Village, utilizing diverse waste sources, such as: cattle, goat, tofu dregs waste, and human waste from boarding schools. Of the 11 people trained in biogas construction, 3 helped build 2 more units in Tapung District apart from the DEB Program. This is marking early success in developing Kampar's local biogas ecosystem. To ensure the sustainability of the program by local community, 4 months of intensive assistance led to the formation of "Biotama Agung Lestari," a biogas user group under the Bhina Muktisari farmers group. Biotama was formed to foster idea exchange and the development of bio-slurry products. They successfully produced 2,200 liters of liquid organic fertilizer, selling 193 liters within two months. The good impact of biogas is not only in economic, social, and community aspects but also includes health and the environment for all the 143 beneficiaries.

Biogas as Part of Water Resources Management Initiatives by SOE

Perum Jasa Tirta II is a State-Owned Enterprise (SOE) mandated to carry out part of the Water Resources Management functions, including the development, operation, and maintenance of water resources, their usage, and the collection, receipt, and utilization of Water Resources Management Service Fees. It also acts as a Water Resource Manager. Due to the large number of people, particularly cattle farmers, who dispose of organic waste into the Citarum River Basin, PJT II, in collaboration with YRE, created a waste management program using biogas for farmers to reduce pollutants entering the river and train the community on using bio-slurry as fertilizer to enhance economic growth.



Figure 18. Biodigester construction with PJT II support

PJT II Biodigester Construction 2017 - 2023

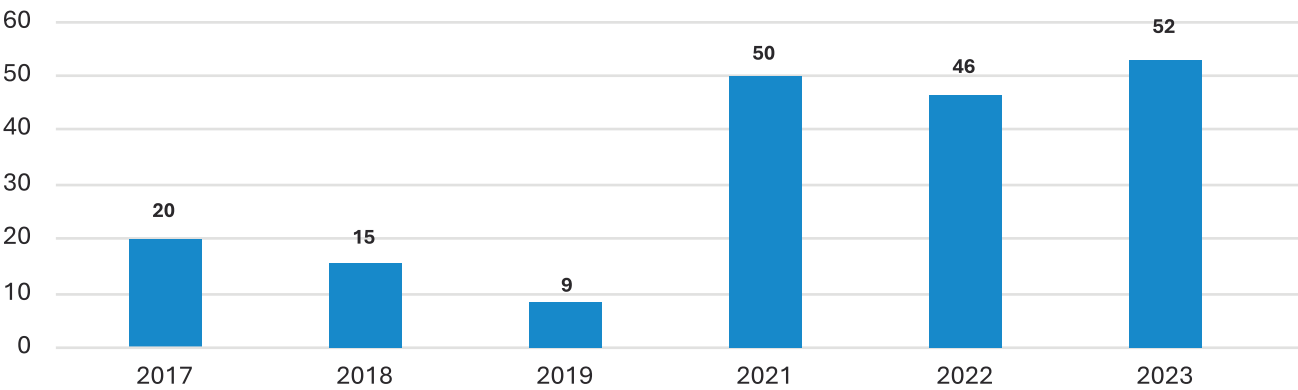


Figure 19. Trend of digester Installation by PJT II from 2017 - 2023

The cooperation with PJT II was formally established in April 2017 under the Citarum Bestari program. YRE and PJT II agreed to extend the cooperation into a second phase until December 2018 to assess the economic value creation of bio-slurry products (organic fertilizer, vermicompost, and household crops) and further develop the market. In 2019, YRE received the ASEAN Energy Award as the 2nd runner-up, recognized as a non-profit institution conducting renewable energy dissemination through biogas development integrated with the real concept of watershed conservation. Although the program officially ended in 2019, PJT II has continued its biogas-

development efforts, partnering with YRE's construction partner, PT. Tirta Putra Mandiri, in 2021 until now. A total of 192 biodigester units have been built with co-financing from PJT II, user fund, and YRE's carbon fund.

Campaign and Education

Biogas Goes to Campus through Merdeka Belajar Kampus Mandiri Program

YRE had the opportunity to participate in the MBKM (*Merdeka Belajar Kampus Merdeka*) Program in collaboration with the Faculty of Food Technology at Universitas Mataram, under the initiative titled "*Biogas Goes to Campus*." This was a year-long program that successfully engaged 10 students in on-campus sessions and 46 students through online learning. The initiative not only provided valuable knowledge about biogas but also inspired students to become agents of change. By harnessing renewable energy such as biogas, the students realized they could actively contribute to environmental preservation, foster a sustainable campus, and educate communities about the benefits of renewable energy, climate change mitigation, and food security.

Sustainability Workshop for Public

The second collaboration with Sebumi took place in early July 2023 through a "Sustainability Workshop" held in Bogor. The workshop aimed to highlight the connection between energy and environment for the long-term human sustainability of human livelihoods. Nine enthusiastic participants were invited to learn more about biogas and its waste-to-energy benefits as a source of cooking fuel. Building on the innovation from 2022 workshop, YRE and Sebumi guided participants in creating a biogas prototype using simple tools and cow manure sourced directly from a nearby shed. Since the workshop was held at a location with existing IDBP biogas users, participants had the opportunity to witness biogas being utilized to support daily cooking activities.

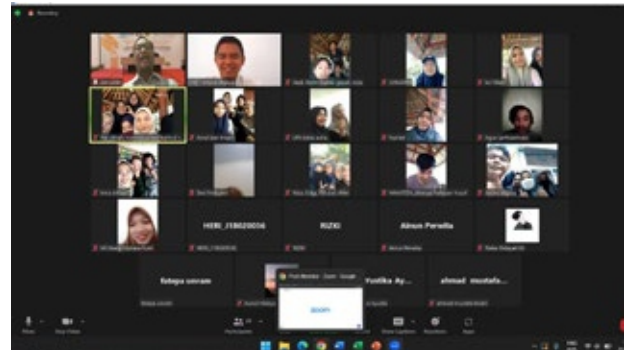


Figure 20. Online session of Biogas Goes to Campus



Figure 21. Students On-Campus Participation in MBKM Program



Figure 22. Participants practice making biogas

Shaping Directions in the Global Level: SSBC Webinars and Internship Support for Strategic Development

As the secretariat for the South-South Biogas Community (SSBC), Yayasan Rumah Energi (YRE) organized two international webinars in 2023. The first, held in August, focused on the role of biogas in advancing a Just Energy Transition (JET). This session brought together 123 participants from Indonesia, South Africa, the Netherlands, Kenya, Nigeria, Pakistan, and Uganda. Esteemed speakers included Dr. Sonny Mumbunan from UNDP Indonesia, Dr. Charles Gyamfi Ofori from the Africa Centre for Energy Policy, and Mr. Michel Muvule Pinto from Biogas Solutions Uganda Limited. Key takeaways from this webinar included the need for a clear definition of “just” and “energy transition,” along with an emphasis on addressing energy transition across multiple levels—from households to national strategies. Participants explored how these layers of transition interconnect and underscored the importance of collaborative efforts among stakeholders to effectively allocate resources and implement impactful programs. Also, the need to make a strong business case for biogas, not just based on emissions reduction but also on improving profitability and creating competitive products with the realigning government policies and regulations.

The second webinar was held in November 2023. This webinar discussed nature-based solutions that integrate renewable energy and sustainable agriculture as the main themes. The panelists of this webinar are Nisa Usman from PUR, Jackson Abuli from Afrinet Carbon Ltd., and Andre Susanto from PT Pupuk Suburkan Negeri, guided by Fito Rahadiano from Earth-Centered Economy Coalition as moderator. The two nature-based products that SSBC will be focusing on in this webinar are biogas and bio-slurry. Biogas is seen as a crucial solution for reducing the use of fossil fuels in energy production and agricultural processes while bioslurry can be used as an alternative to chemical fertilizers. However,

there are logistical challenges in terms of getting spare parts for biogas and utilizing emerging technologies within the trend of organic farming.

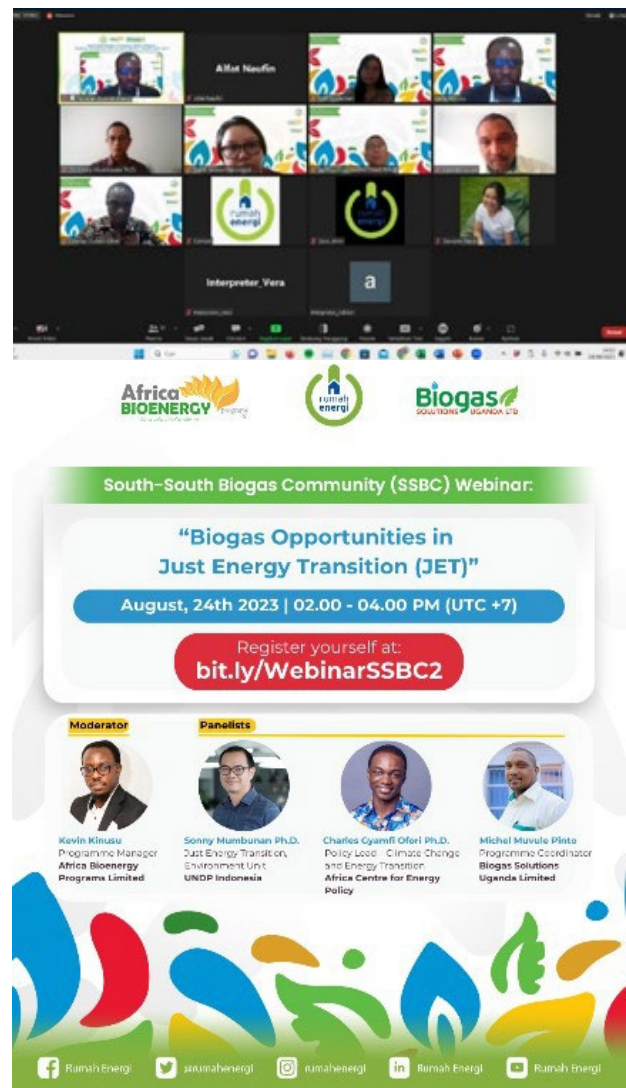


Figure 23. Cross-nation shared learnings through SSBC webinars

The key highlights of the webinar are: 1) The importance of community engagement and building strong relationships to ensure the success of nature-based solutions projects; 2) The need to scale up biogas infrastructure, specifically regarding biogas components, repairs, facilitation, and technicians. Biogas is a promising solution for communities, especially when integrated with organic farming and fertilizers to enhance sustainable agriculture; and 3) Emphasizing the circular nature of our economy and the importance of maximizing the use of waste-to-energy and matter value chains to combat climate change.

To support the formulation of SSBC Secretariat strategy, a group of four university students from the Young Leaders for Indonesia (YLI)—an intensive leadership development program by McKinsey & Company Indonesia—enhanced the secretariat’s objectives scoping and mapping, developed a roadmap for SSBC initiatives, and assisted in organizing and developing SSBC webinars. YRE hosted and mentored the YLI program participants virtually for 3 months, from August to October 2023.

Using interviews with representatives of SSBC member stakeholders, the YLI participants gathered insights on the expected roles and responsibilities of the SSBC Secretariat. These findings were distilled into a clear vision, mission, objectives, and actionable steps, leading to the formulation of key duties and responsibilities, as well as the prioritization of initiatives. Through this collaboration, YRE received essential support in advancing SSBC’s operations during a time of limited dedicated personnel.

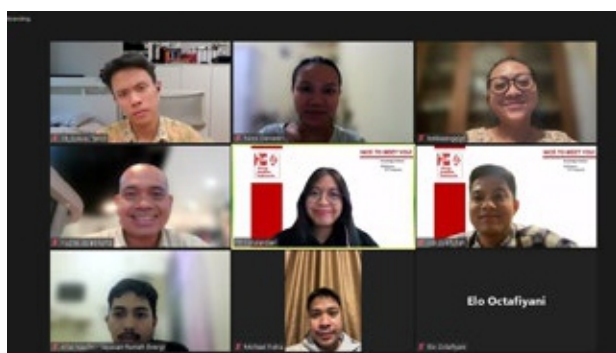


Figure 24. YRE - YLI Participant Zoom Meeting

Biogas System Monitoring and Repair

Biogas Repair

According to Biogas User Survey (BUS) 2022 interview data monitoring, out of 554 respondents, 100 respondents were no longer using biogas and did not complete the interview. Furthermore, there is additional 156 users confirmed they are facing problems with biogas installation. 135 users said they had technical issues and 21 users had non-technical issues. Because of these problems, 76.8% have not used their biogas-

for 1-6 months, 12.5% for 1-2 weeks and 10.7% for 3-4 weeks. The problems are categorized into two groups, technical and non-technical problems

Table 4. Biogas Technical Problem in BUS 2022

Biogas does not work because of Technical Problem	TOTAL	VPA 2	VPA 1
BASE: Total respondents	135	93	42
Biogas damaged/leaked	3,7%	1,1%	9,5%
Biogas not producing gas/small flame	9,6%	6,5%	16,7%
Stove/installation/pipe damaged	48,6%	7,5%	23,8%
N/A	74,1%	84,9%	50,0%

From table above, the technical issue that is often faced by biogas users is on pipe and stove part, reached about 50%, then small flame produced. For pipe it might be research further what would be the reasons or is there any pipe product that specifically produced for biogas flow. While for small flame it might be caused by technical or non-technical reason, whether farmers filled digesters with sufficient manure or not, with the right composition between manure and water or not

Table 5. Biogas Non-Technical Problem in BUS 2022

Biogas does not work because Non-Technical Problem	TOTAL	VPA 2	VPA 1
BASE: Total respondents	21	15	6
Difficulties to reload animal manure	23,8%	26,7%	16,7%
Has no livestock	33,3%	40,0%	16,7%
House/kitchen/shed renovation	23,8%	26,7%	16,7%
No longer functioning due to building construction, renovation, or cage relocation	4,8%	0,0%	16,7%
No one regularly fills in animal manure	14,3%	6,7%	33,3%

From the non-technical aspect, as shown on above table, most of the problems were caused by the users no longer has livestock (33.3%), followed by difficulties in reload manure and the kitchen was being renovated, both at 23.8%, no one regularly fill the manure (14.3%) and the cage relocation (4.8%). There is a significant difference between no livestock and difficulty to reload animal manure from VPA1 and VPA2 users. It seems that users of VPA2 sold or loss their livestock, might be due to the recent foot and mouth disease pandemic in cattle as well as swine fever in pigs.

Table 6. 2023 Biogas Repair by Province

Province	Total Biogas Repaired
Bali	24
DI Yogyakarta	31
West Java	20
Central Java	27
East Java	50
Lampung	11
West Nusa Tenggara	48
South Sulawesi	14

Broken Biodigester Repair in 2023

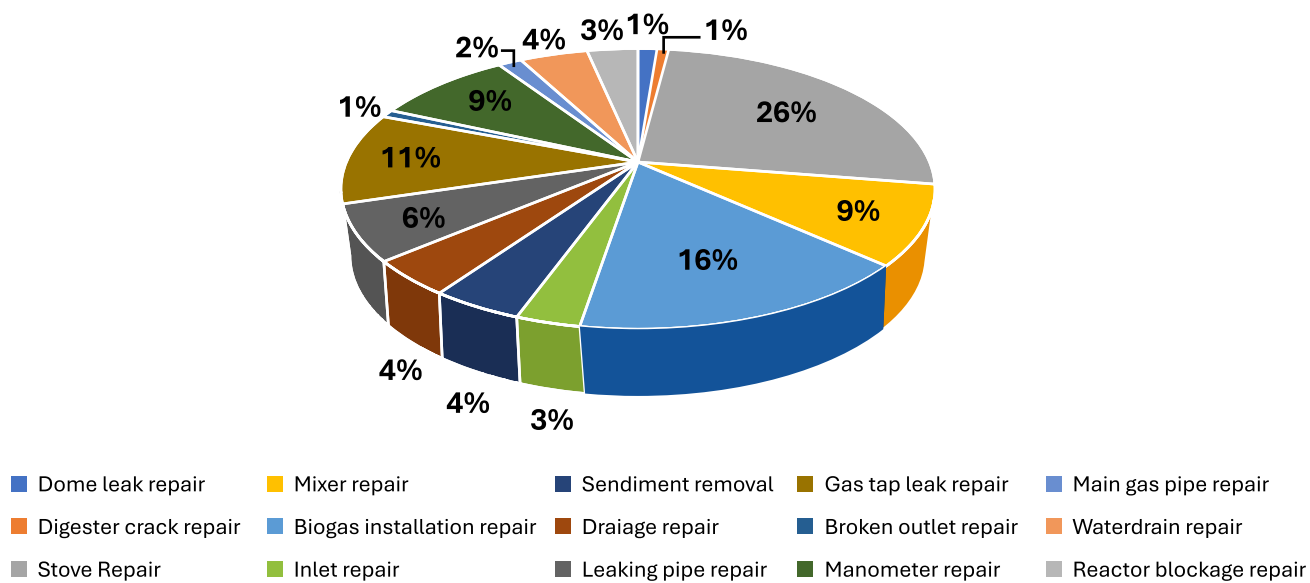


Figure 25. Broken Biodigester Repair in 2023

Repairs to damaged biogas units in 2023 were carried out based on drop-off data from the 2022 Biogas User Survey. These repairs were implemented in Q4 2023. A total of 225 biogas units were repaired, with East Java province having the highest number of repairs at 50 units. Challenges in carrying out these repairs include: 1. Limited human resources on the IDBP team to manually check the repair results, so verification can only be done online via Kobo Toolbox; 2. Some biodigester units need repairs, but the CPO responsible for producing the biogas is no longer active. This can be addressed with the help of active CPOs who are willing to repair the biodigesters; 3. The most frequent issue reported by users is stove damage (26%), caused by high levels of H2S produced by the reactor, which leads to quick rusting of the stove. Innovation is needed to reduce reactor H2S levels or develop rust-proof stoves. Based on the biodigester damage graph, aside from stove damage, there are also significant problems in the biogas installation network, with 16% of cases involving leaks in the pipe connecting the reactor to the stove. A biodigester can have two or more damage issues.



Figure 26. Biodigester repairs conducted by the CPO

Biogas Monitoring System through ASS

Table 7. List of CPO that conduct ASS 1 in 2023

CPO ASS 1	Total surveyed Biodigester
Bali Santi	20
CV Mitra Bumi Abadi	18
CV Riski Abadi	15
Datu Sakti Mason Group	485
LPKP	1
LPTP	11
Mason Group Sangkareang	22
Ujung Berung MG	29
Regol	9
UD. Cahaya Wana Bakti	2
Yayasan Qaryah Thayyibah	8
Yayasan Sion	30
YRSI	1174

Table 8. List of CPO Conduct ASS 2 in 2023

CPO ASS 2	Total surveyed Biodigester
Bali Santi	22
CV Riski Abadi	13
Datu Sakti Mason Group	176
Ujung Berung MG	87
Mulya Abadi MG	23
Tunas Mandiri MG	73
Wahana Rizki	22
Yayasan Manikaya Kauci	5
Yayasan Qaryah Thayyibah	20
Yayasan Sion	40

IDBP has a monitoring system for biodigesters that have been built, called After Sales Services (ASS). ASS is conducted by the CPO who built the biodigester, 1 to 3 years after construction is finished. The CPO conducting ASS will be rewarded an incentive from biogas carbon subsidies of Rp 150,000 per unit surveyed. During these years, the CPO has the ability to conduct surveys twice, referred to as ASS 1 for the first survey (9 to 12 months after construction is completed) and ASS 2 for 24 to 36 months after construction is completed. The main point is that if a CPO surveys ASS 1 and 2 for one biodigester, they will receive Rp. 300,000 per unit in total.

The purpose of ASS is to monitor the biogas still used by the households or not. It's also as quality control for CPO if the biodigester has any problem i.e gas leaks, broken stove, or the user not using biogas because of non-technical cause. With the ASS data, the IDBP can monitor the development of biogas and bioslurry usage in the community to formulate effective strategies for enhancing the biogas market in Indonesia. The CPO also- feels responsible for maintaining product quality and generating possible income from biodigesters that need repairs.

There are 16 CPOs who carry out ASS 1 or ASS 2 in 2023. The CPO that conducts the most ASS in 2023 is YRSI in the West Nusa Tenggara area. The challenge for the CPO in conducting ASS occurs when there are digesters that are too far away, requiring extra transportation costs that make the survey not worthwhile, as the capital to survey exceeds the ASS incentive. Sometimes there are CPOs that make errors in data administration, resulting in some digesters not having ASS conducted more than 3 years.



Figure 27. Biogas user when surveyed by CPO

Impact Highlights

IDBP aligns its activities with several Sustainable Development Goals (SDGs). The annual Biogas User Survey (BUS) is a key tool for measuring these impacts. The BUS assesses user satisfaction, evaluates the technical performance of biogas digesters, and provides critical data for annual carbon monitoring.



SDG 1 – No Poverty

Biogas has led to significant cost savings for farmers, primarily in reduced fuel consumption. According to the 2023 Biogas User Survey (BUS), households that previously relied on firewood saved an average of IDR 15,000 per month, while those who reduced LPG usage saved around IDR 35,000 monthly (see figure 28). Some households even reported savings of up to IDR 205,000 per month. These savings have been allocated towards various household needs, including additional expenses (71%), children's education (19%), savings (6%), and business capital (3%) (see figure 29).

Monthly Fuel Cost Before and After Biogas

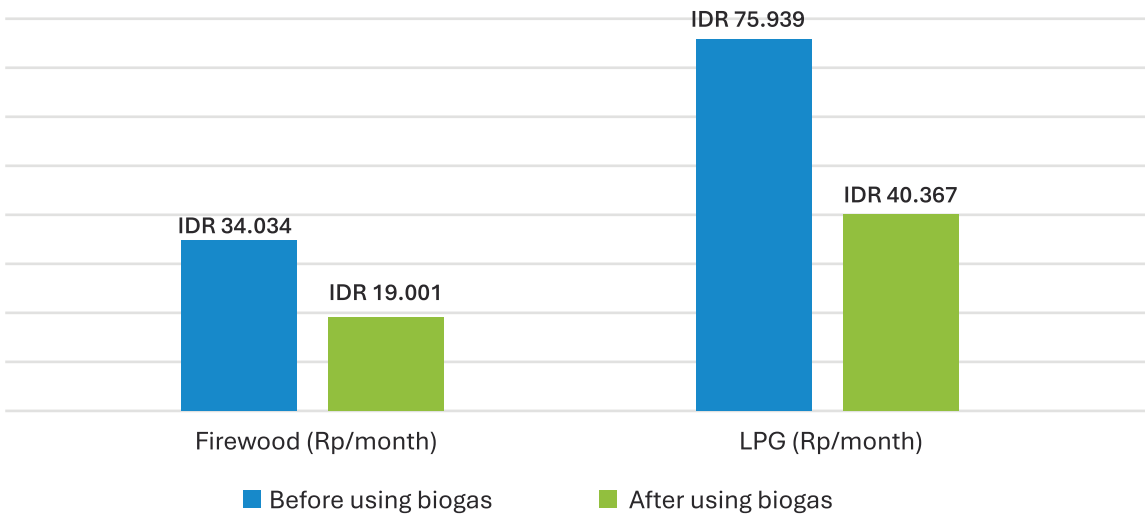


Figure 28. Monthly Fuel Cost Before and After Biogas

Utilization of Money Saved from Fuel Expense Reduction

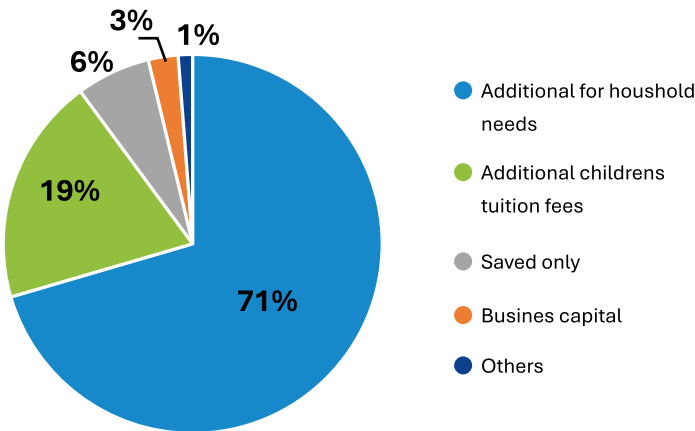


Figure 29. Utilization of Money Saved from Fuel Expense Reduction

In addition to fuel cost reductions, biogas users have also benefited from lower fertilizer expenses. By utilizing bio-slurry from the biogas process, nearly half of the respondents (49.8%) have reduced their spending on both chemical and non-chemical fertilizers, averaging around IDR 346,592 per year.

Allocation of Free Time Gained After Using Biogas

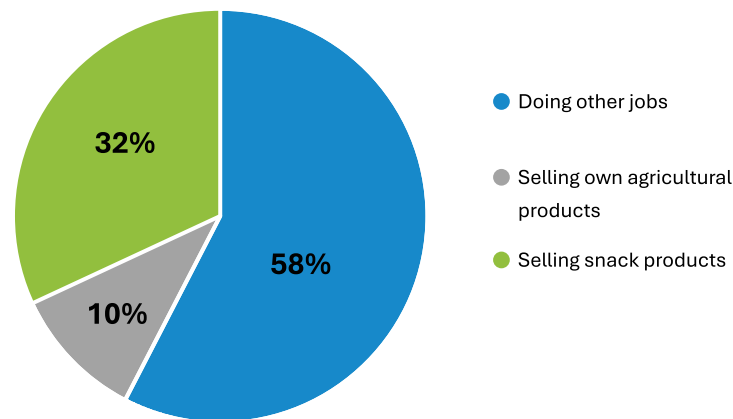


Figure 30. Allocation of Free Time Gained After Using Biogas

There is also increased free time gained from reduced manual labor after using biogas, averaging 2 hours per day, that has been used for various economic activities, such as side jobs (57.7%), selling snacks (31.7%), and selling agricultural products (10.6%) (see figure 30). Overall, 75% of farmers have reported improved social and economic conditions since adopting biogas technology.



SDG 2 – Zero Hunger

Nearly half of the respondents (49.8%) confirmed their utilization of bio-slurry in various ways: applying it to their own agricultural land, using it to cultivate grass around livestock cage, or sharing it with others.

The widespread adoption of bio-slurry among biogas users, particularly small-scale farmers with landholdings under one hectare, has led to significant reductions in fertilizer usage. By substituting chemical and non-chemical fertilizers with bio-slurry, farmers have reduced their fertilizer consumption from an average of 216.9 kg to 148.4 kg per application (see figure 31).

Fertilizer Bought and Used After Having Bioslurry (kg/application)

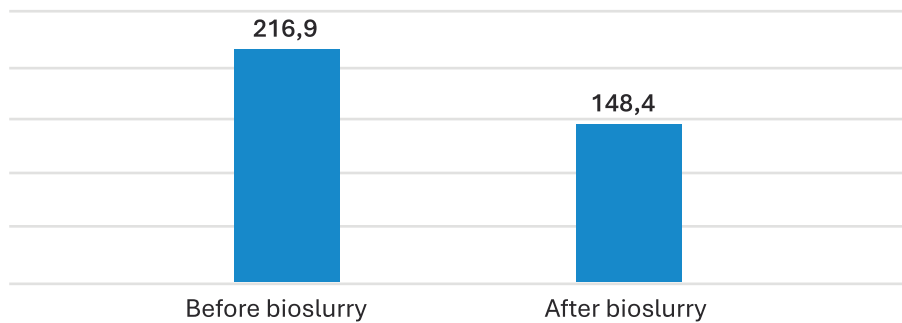


Figure 31. Fertilizer Consumption After Having Bioslurry

The beneficial impacts of bioslurry on agricultural practices are evident. A significant majority of biogas users have reported increased soil fertility (100%), higher crop yields (94%), improved drought resistance (92%), and enhanced pest and disease resistance (70%) (see figure 32). Common crops cultivated by these farmers include grass, rice, corn, chili, and sugarcane.

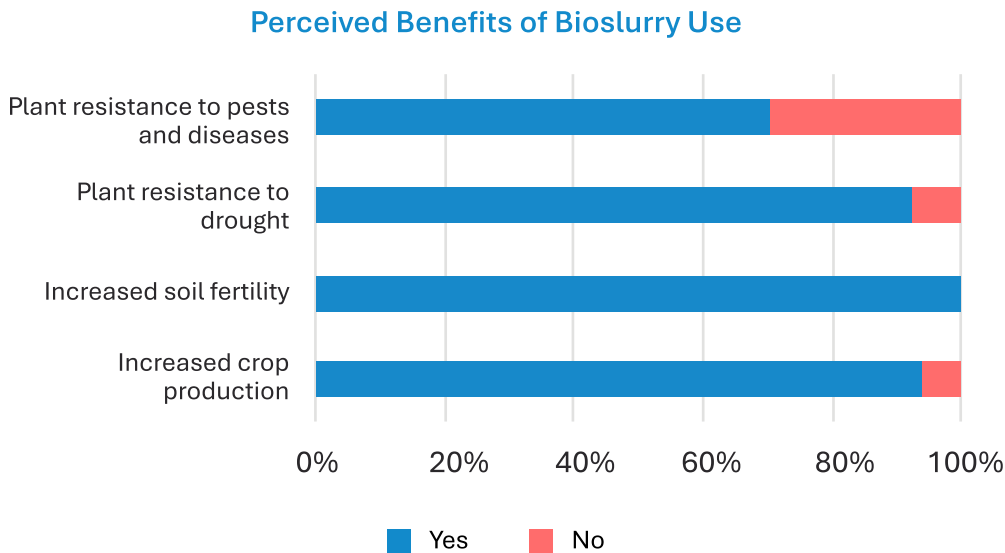


Figure 32. Perceived Benefits of Bioslurry Use

SDG 5 – Gender Equality

The 2023 BUS revealed that female family members (63%) are projected to be the primary beneficiaries of biogas installation. While male family members often take the lead in the initial decision-making process (see figure 33), a significant proportion of households (25%) involve female members in the decision-making process, and another 18% report joint decisions between male and female members.

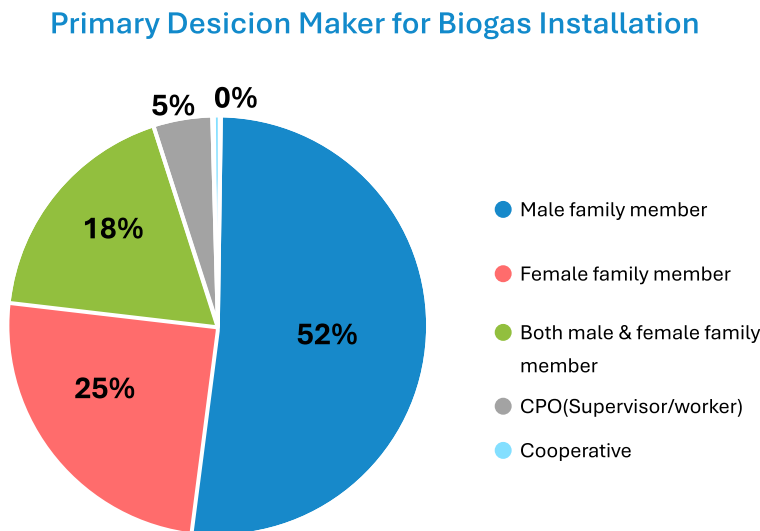


Figure 33. Primary Decision Maker for Biogas Installation

Interestingly, when it comes to managing the financial savings generated by biogas, female family members are predominantly responsible (74%) (see figure 34). This aligns with the common household dynamic where women often play a crucial role in managing household finances, highlighting the potential for biogas to empower women and contribute to gender equality in energy access and utilization.

Family Member Who Manage Household Income

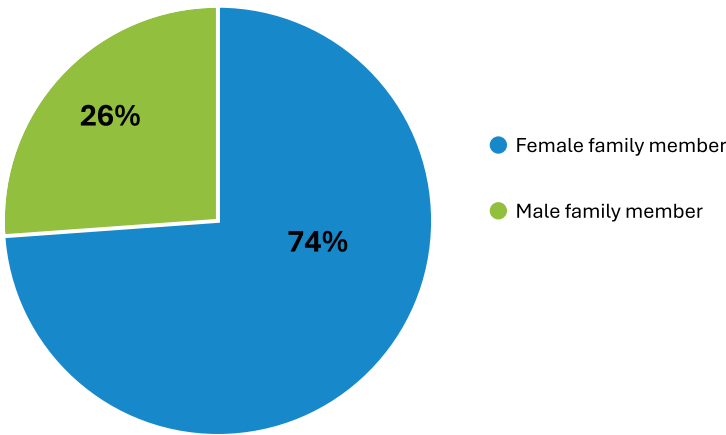


Figure 34. Family Member Managing Household Income



SDG 7 – Access to Energy

Biogas installation has led to significant reductions in fuel consumption. Firewood usage has decreased from 16.3 kg/day to 9.1 kg/day, while LPG consumption has dropped from 10 kg/month to 5.3 kg/month (see figure 35).

The continued use of firewood and LPG, albeit at reduced levels, is primarily attributed to specific household needs. Some households use firewood stoves for cooking water for livestock or bathing, while others rely on these fuels as backups for large-scale cooking events or to meet faster cooking requirements.

Volume of Fuel Before and After Biogas (kg)

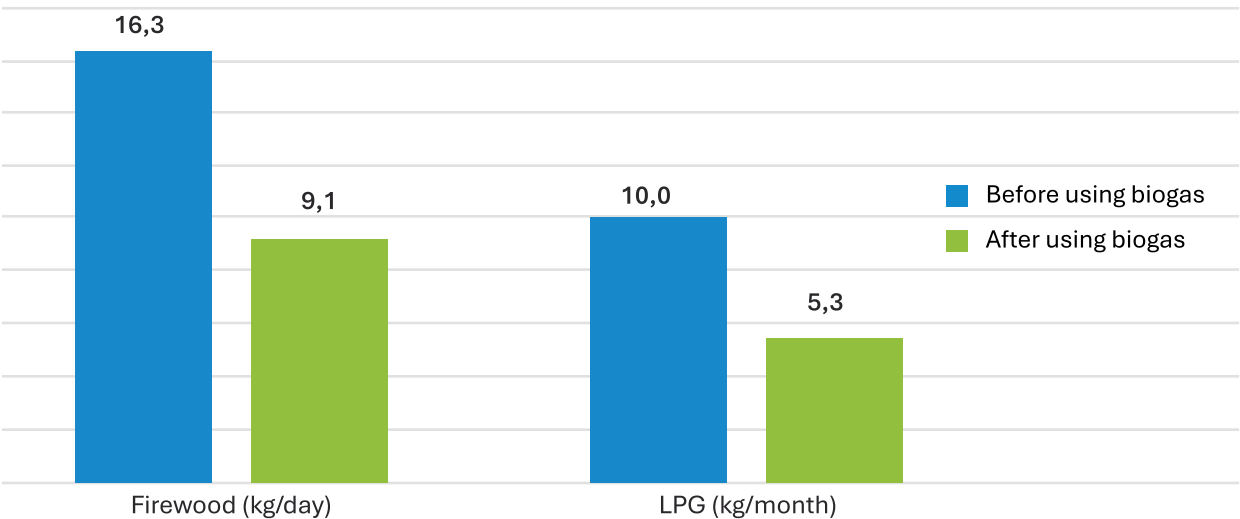


Figure 35. Fuel Consumption Before and After Biogas



SDG 13 – Climate Action

Biogas offers a sustainable solution to reduce greenhouse gas (GHG) emissions. By converting methane into carbon dioxide, biogas significantly mitigates the potent warming effects of methane emissions from manure and waste management. As of December 2023, IDBP's biogas installations and utilization efforts have contributed to a cumulative reduction of 528,781 tons of CO₂ equivalent (tCO₂e) in GHG emissions.

Stories from the Community



“ Since using biogas, my life is now easier. No need to bother looking for firewood for hours, especially since the smoke makes your eyes sting. For women, cooking is now more comfortable and they have time to produce coffee.
Siti Halimah, KWT Kaki Rinjani Desa Karang Sidemen.

Siti Halimah, KWT Kaki Rinjani Desa Karang Sidemen



“ I use bio-slurry in my palm oil plantation. At one time, the harvest was usually 2 quintals; now, it can be 5 quintals. The palm fruits are also bigger. If sold, there is an additional 200 thousand—300 thousand rupiah for one harvest.”
Sudarno, Muktisari Village, Kampar.

Sudarno, Muktisari Village, Kampar

IDBP Transition

Spin-off Social Business Establishment for IDBP Sustainability

Following the issuance of Presidential Regulation on Carbon Economic Value Implementation, which mandates carbon trade management requirements for business entities, YRE established a business unit called PT. Biru Karbon Nusantara (PT. BKN) in March 2023. The primary objective of PT. BKN is to return the benefits of carbon transactions to local communities, contributing directly to the site level. By restoring the planet and aligning the benefits of activities in energy and agriculture, PT. BKN seeks to foster global sustainability through the provision of consulting services, training, and sustainable financing.

To ensure the continued sustainability of the IDBP, YRE transferred its management, including carbon MRV management and trading functions, to PT. BKN under a Novation Agreement signed in June 2023. Ensuring a seamless transition process, YRE has engaged in intensive communication and consultation with key domestic partners, particularly CPOs in participation agreements and biogas users' households. Additionally, consultations with international partners, including IDBP carbon buyers and brokers, have resulted in mutual understanding, formalized through the signing of the Novation Agreement by both parties. A Business Transition Plan was also developed to guide the handover of IDBP carbon activities, considering current policies and potential future developments. The IDBP program has seen a series of management transitions—from Hivos to YRE, and now to PT. BKN—with the Gold Standard Foundation finalizing the CME registration transfer to BKN in October 2023.

Carbon Registry Alignment Processes

Since 2022, YRE has been working on registering mitigation actions on the National Registry System (SRN) platform, as required by the Presidential Regulation on Carbon Economic Value. Although the digital platform and technical guidelines were not yet available, YRE submitted the Mitigation Action Plan Document (DRAM) as the project proponent to the National Greenhouse Gas Inventory Unit at the Indonesian Ministry of Environment and Forestry by the end of 2022.

Following the transfer of program management to PT. BKN, IDBP registration to the SRN was then submitted under PT. BKN's name. YRE and PT. BKN worked together to address feedback from the Ministry of Environment and Forestry's expert team, ensuring there would be no dual carbon accounting in either the Gold Standard registry or the SRN.

With the introduction of Article 6 of the Paris Agreement at COP-27 in 2022, countries are encouraged to maximize their emission reduction targets outlined in their Nationally Determined Contributions (NDCs) through national efforts. This has sparked discussions about whether international carbon trading could be a viable tool for meeting these targets. Meanwhile, in 2023, the integrity of the Voluntary Carbon Market (VCM) gained attention from carbon project developers and market perceptions. The Integrity Council for the Voluntary Carbon Market (ICVCM) plays a crucial role in driving guidelines that emphasize robust validation, verification, and monitoring methods.

During the 2023 Measurement, Reporting, and Verification (MRV) cycle, the Biogas User Survey (BUS) and baseline survey were conducted. The baseline survey is a data collection requirement for the renewal of the VPA2 crediting period, which will be needed in 2024. By the end of December 2023, the MRV process reached Performance Review Round III from SustainCERT, estimating the issuance of 64,219 tCO₂e VER in January 2024.

Challenges, Lessons Learned, and Way Forward

Policy and Regulation

National Carbon Economic Value and Trading Regulation

After the issuance of the Presidential Regulation on Carbon Economic Value in 2021 and the Carbon Economic Value Implementation Governance in 2022, the Ministry of Environment and Forestry launched the Technical Guidelines on Issuance and Implementation of SPEI (Indonesia's Emission Reduction Certification) in 2023, followed by the launch of the National Carbon Exchange by Indonesia's Financial Services Authority (OJK). Despite these advancements in domestic carbon trading systems and regulations, the Indonesian government is still in the process of developing and finalizing mechanisms for international carbon trading. This delay is partly influenced by the approaching political year of 2024, which has slowed down policy developments on strategic issues.

In light of this situation, the Indonesia Domestic Biogas Programme (IDBP) has postponed its process of selling carbon credits internationally and needs to adjust subsidy values and targets for new units that can still be financially supported by YRE. IDBP is also working to register its projects in the national climate action registry, while addressing a unique situation. Since IDBP has been registered with the Gold Standard platform since 2013, it needs to make sure that its projects align with the national system without risking double counting or double claiming of emissions reductions.

National Regulatory Framework for Biogas Development

Indonesia has made progress in promoting renewable energy, including biogas, but the current regulations still face challenges in fully supporting this sector. While the country has bioenergy targets under the National Energy Policy (KEN) and the National Energy Plan (RUEN), these policies mostly focus on biofuels, with few clear guidelines or incentives for biogas development. This lack of a dedicated national biogas policy has caused biogas efforts to be fragmented across different sectors like agriculture, energy, and waste management, without a unified approach. As a result, coordination between ministries, local governments, and the private sector is weak.

A comprehensive national law focused on biogas development is needed, with clear incentives, technical standards, and better coordination across sectors to support large-scale adoption of biogas. Even though Presidential Regulation 112/2022 aims to speed up renewable energy development, it mainly supports solar and hydropower, leaving biogas, especially in rural areas, underfunded- and underdeveloped. Local governments need more support to promote biogas, particularly through waste management and local energy programs.

Improving regulations would help create a better investment environment, especially for small and medium-scale renewable energy projects like household biogas, which are important for Indonesia's decarbonization and net-zero goals. Advocacy is also needed to ensure that biogas is included in the Just Energy Transition (JET) framework, not just large-scale power generation.

Research and Development

More Affordable Biogas Technology Innovation

The cost of biogas has been rising over the years, making biogas installation a significant investment for communities. According to data from the Indonesia Domestic Biogas Programme (IDBP), self-financing for biogas installations dropped from 88% in 2022 to 55% in 2023. This decrease happened alongside changes in subsidy amounts, which also led to fewer biogas units being built this year. Geographically, community-financed biogas installations in 2023 were concentrated in certain regions, indicating disparities in the financial capacity of communities across different areas.

Considering these findings, YRE recognizes the need for research and development to create more affordable biogas technology solutions. YRE also wants to explore other ways to help fund biogas installations, such as pay-as-you-go systems or innovative loans using collateral. YRE aims to explore research partnerships with local universities, higher education institutions, and technology provider companies in creating biogas technology that users can easily install themselves (using prefabricated and/or portable systems). This innovation builds on the fixed dome technology while addressing the needs and technical feasibility for potential users, such as limited land space in certain areas. This would make biogas more- affordable and accessible for more communities, helping to keep biogas adoption growing across Indonesia.

Remote Monitoring System Strategy

Given the limited human resources in the BIRU Program and its coverage across various provinces in both western and eastern Indonesia, there is a need to develop a robust monitoring system to address these challenges. Remote monitoring using sensor technology, which was piloted in 2021 and 2022, faced difficulties in upgrading devices procured from foreign technology providers.

Continuing to rely on foreign technology can lead to high costs, especially when upgrades or maintenance require materials that are only available abroad.

In light of this, YRE believes it is essential to develop a capable remote monitoring system using local technology. Research and development for the monitoring system will be a key agenda for the coming years, aiming to strengthen the IDBP monitoring system and enable automated operation.

However, when implementing new technology, it is important to consider the level of literacy among biogas users. The monitoring technology should address user issues and mitigate potential challenges, so that its added value increases users' sense of ownership over both the biogas technology and the monitoring program. This will ensure that benefits are not limited to the program managers of IDBP but also extend to the users themselves.

Area of Work Expansion

There are many areas in eastern and western Indonesia that could benefit from biogas development, with 18 out of 38 provinces still not served by the IDBP program. This shows a great chance for expansion. To reach these new areas, IDBP needs to build skilled teams and connect with local partners. Finding new Construction Partners Organizations (CPOs) and creating networks with existing ones is important. This approach aims to address local human resource challenges for biogas installation, operation, and maintenance.

In addition to building technical capacity, effective outreach and collaboration with relevant stakeholders are essential for expanding IDBP's reach. Efforts to educate and promote renewable energy through biogas will empower local biogas users and partners as effective educators and promoters in new market areas.

Biogas Development and Agricultural Sector Interdependence

The development of biogas in Indonesia is closely linked to the state of the agricultural sector, particularly livestock. The primary biogas feedstock, cattle manure, is directly impacted by the livestock industry's conditions. In the first half of 2023, the Foot and Mouth Disease (FMD) outbreak affected both beef and dairy cattle farmers, redirecting their investments toward livestock recovery and care. Field reports reveal that some farmers even shifted to crop farming to sustain their incomes, while BUS 2023 data indicate that IDBP users have low average livestock ownership. To address these challenges and ensure a sustainable biogas feedstock supply, expanding to other organic waste sources is essential to support sustainable utilization by biogas users. YRE also recognizes the potential to improve farming and agriculture practices, particularly Good Farming and Agriculture Practices. Intensifying education efforts on these practices at the community level can further support sustainability and highlight biogas as a critical solution.

Bridging Bioslurry Access to Market

As noted in the Bioslurry Utilization in Households section above, less than 50% of surveyed IDBP biogas users utilize the bioslurry. This low adoption rate is primarily due to limited awareness of bioslurry's benefits as a high-quality, eco-friendly organic fertilizer, as well as challenges in accessing broader markets. Additionally, the long-standing use of chemical fertilizers among farmers makes it difficult to change habits quickly.

Currently, most demand for bioslurry comes from outside Java, but high distribution and mobilization costs are an issue, as PT PSN's production is centered in East Java. Business strategies, such as franchising, could support wider distribution,-

particularly beyond Java. Strengthening partnership networks is also crucial for business growth, brand awareness, and expanded market reach.

Partnership with Global Countries

Partnerships with countries experienced in biogas development can accelerate the transfer of technology and knowledge, allowing emerging biogas programs to adopt proven practices efficiently. Training initiatives within these partnerships can equip local workers with critical skills, building a strong national capacity for renewable energy management. IDBP will proactively expand its network and seek global partnerships to support long-term biogas growth. Collaborating with experienced partners and technology providers will give IDBP access to valuable insights, strengthening its ability to lead in adapting biogas solutions that meet local needs.



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