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The First Payment Mechanism on Domestic Biogas in Indonesia (Indonesia Domestic Biogas Programme)

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The First Payment Mechanism on Domestic Biogas in Indonesia (Indonesia Domestic Biogas Programme)

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Abstract—This paper aims to provide information on renewable energy program in Indonesia a case of Indonesia Domestic Biogas Programme (IDBP/BIRU), the actor, existing funding (credit) mechanism, the elements, types and information about the benefits of the program. BIRU is the first program on Renewable Energy (biogas) small scale (domestic-household) that applied payment mechanism in Indonesia. Initially many program on biogas small scale is not running well (sustained) with free mechanism (grant) support from Government of Indonesia, Donor or NGO.

Methodology of this research is descriptive-qualitative method (case study). Data resources from primary and secondary documentation, archival record, open ended interview and participant observation. Finding- BIRU is the first program on domestic biogas in Indonesia with payment mechanism and sustained. BIRU create multiplier effect on economic development and non-economic benefit.

Originality of this paper add the literature on biogas small scale related to development the sectors, the financing mechanism and stakeholders especially for Indonesia.

Keywords—*Biogas Rumah (BIRU; Biogas small scale; Sector Development; Payment Mechanism on Domestic Biogas; Sustainable*

I. INTRODUCTION

Indonesia is country that comprises more than 17,000 islands along the Ring of Fire and has a geographically fragmented population. To enhance the sustainable energy supply in the long term, the Indonesian government has embarked on an ambitious path to increase the use of renewable energy with a target of 23% share of renewable energy in the total energy mix in 2025 [1]. Furthermore, the government intends to reduce the national emission of greenhouse gas into the atmosphere with 29% (up to 41% including foreign aid) by the year 2030 [2], and energy sector is expected to have a significant contribution to the emission reduction.

Biogas is renewable energy carrier with a potential for diverse end-use applications such as heating, combined heat and power (CHP) generation, transportation fuel (after being upgraded to biomethane) or upgraded to natural gas quality for diverse applications. In developing countries mainly with household-scale digesters, however, the end use of biogas is primarily limited to cooking and lighting. This is because the most common digester in the developing countries is of 2–10 m³ size, and the volume of biogas produced from such digester cannot accommodate CHP or purification into biomethane for other end-use purposes [3].

Biogas is one of alternative solution that answered the energy needs in Indonesia on rural area.

SNV's feasibility study (FS) in 2008 on Domestic Biogas program in Indonesia, there was 6,131 digesters was built [4]. Most of the plants installed is not running well due to broken or lack of maintained. The FS argues according assessment on potential demand, social factors willingness and ability to pay, financial analysis and economic analysis is feasible to running domestic biogas in Indonesia.

In 2009, The Indonesian Ministry of Energy and Mineral Resources, together with the Dutch Government, represented by the Dutch Embassy commenced a program related to the development of biogas sector, namely Biogas Rumah (*Household Biogas/BIRU*). This program was aimed to have 8000 digesters built by 2012. This program is executed by *Humanistic Institute for Development Cooperation* (HIVOS) and *SNV Netherlands Development Organization* (SNV) as technical adviser. Both are Netherland-based non-profit organizations, experienced in biogas development. The overall budget required is estimated to be 6.4 million euro. The technology used in BIRU digesters is fixed dome, adopted from Nepal where SNV has implemented such technology since 1992. Fixed dome was chosen due to its durability, minimum 15 years, cheap maintenance, and it is easy to use. digesters were not given for free to farmers (household). For each digester BIRU subsidized Rp. 2,000,000 [4]. The remaining of the payment is paid by farmers to the farmers' union, cooperative or loan from banks and non-bank financial institutions. The cost to build digesters around Rp. 4,000,000 – 24,000,000 depend on volume [5].

Since 2009, BIRU are obtaining funding support from several donor as grant. The period 2009 till 2012 is call first phase of BIRU program when funded by Dutch Government (Royal Nederland Embassy). HIVOS implemented of program and SNV as technical advisor. The second phase of BIRU remarkable with funding from The Royal Norwegian Embassy under a Grant Agreement dated 4 December 2013 and implementation agreement dated 10 July 2014 with Directorate of Bio-energy at Directorate General Renewable Energy and Energy Conservation under Ministry of Energy and Mineral Resources of Republic Indonesia. In 2012, HIVOS initiated establish a non-government organization named *Yayasan Rumah Energi (YRE)* to continue implementing of BIRU and SNV still as technical advisor. Apart from funding from the Norwegian Embassy, BIRU also receives funds from EnDev, OEW, MCAI and HIVOS.

As of 31 December 2016, there is 20,150 [6] units was built in 10 province in Indonesia. It meant within 6 years, BIRU achieve built digesters more than 3 times compare with free/grant mechanism.

This paper aims to provide information about a renewable energy program in Indonesia on small scale (domestic) called Indonesia Domestic Biogas Programme (IDBP/BIRU), the actor, existing funding (credit) mechanism, the elements, types and information about the benefits of the program.

II. METHODOLOGY RESEARCH

Method used in this research is descriptive-qualitative method (study case). Data resources from primary and secondary documentation, archival record, open ended interview and participant observation [7]. Primary data from BIRU office in Jakarta, province and others parties involved in fund distribution. Secondary data from literature researches. The period of research consist of two phase. First phase on 2011 and second in early 2017. The first phase, was conducted in target provinces with BIRU offices that have already had credit distribution mechanism, which are West Java, Central Java, Yogyakarta, and East Java. The second phase was conducted in National office only. The scope of this research covers credit distribution mechanism to farmers, construction partner organization (CPO), financial institutions, and other institutions directly involved with credit distributions as well as the benefits of BIRU program.

III. DATA RESULT AND FINDINGS

A. Actors in This Program

The actors in this program are those who are involved in and take parts in BIRU as follow [8] [9];

1. Biogas (digester) Facility Owners (DFO); dairy cow farmers or beef cattle farmers participating BIRU. As of 31 Desember 2016 there are 20,150 farmers participant on program.
2. Construction Partner Organizations (CPOs); CPOs are BIRU's prime partners, They could be from profit or non-profit institution who have to recruit, train, and employ construction workers. In 2016, total 65 partners were registered.
3. Financial Partner Organizations (FPOs); FPOs are creditors (banks) or others intitution that provide loan to DFO. On first phase there was Bank Mandiri Syariah, Rabo Bank , PT. Nestle Indonesia (Nestle), Dairy Cooperative and Local Cooperative. at second phase are Nestle, Rabobank Foundation, Kiva, Credit Union, NGO and Cooperative. As of December 2016, there is 46 institution provide credit (loan) involve in BIRU.
4. BIRU Promoting Partner Organizations; Organizations involved in BIRU to raise target group's interest in biogas, as well as gender equality promoting partner experts to raise women's awareness of biogas benefits in daily household life.

5. Training Partner Organizations; These organizations give trainings in certain fields. These fields are not limited to constructions, and trainings in other fields such as micro-financing is possible when necessary.
6. Extension Partner Organisations (EPOs); EPOs help families in raising their understanding and optimizes the economic values of slurry (biogas waste) usage.
7. Other BIRU Partner Organizations; These organizations may create partnerships with various other partners, depending on the program's priority as well as available synergy opportunity.
8. BIRU team; BIRU team are responsible in the implementation of all BIRU activities. BIRU team consists of two type. National Biogas Programme Office Support Office (NBPSO) and Provincial Biogas Program Offices (PBPO). NBPSO allocated in Jakarta. As of 2016, BIRU has 8 PBPO, there are West Java, Central Java (Yogya), East Java, West Nusa Tenggara (NTB) & Bali, South Sulawesi, Lampung and Sumba.

B. Funding of Program

In 2009-2012, BIRU received funding Royal Nederland Embassy amounting EUR 6.4 million. The mandate was to development domestic biogas sector in Indonesia. 2013-2016, BIRU received funding from Norway Embassy, Endev, MCA-I, OEW, HIVOS as follow [9];

TABLE 1. FUNDING 2013-2016

Donor	OEW	ENDEV	Norway Embassy	HIVOS	MCAI
Amount	€240k	€2.3m	€732k	€2.2m	\$900k

C. Number of Digester Built

According data from BIRU databased, the number of digester was built from 2009 to 2016 are as follows [6];

TABLE 2. DIGESTER BUILT BY YEAR

Year	09	10	11	2012	2013	2014	2015	16	To
Q	62	1,586	2,995	3,339	3,269	2,973	2,383	3,543	20,150

D. Ownership Mechanism and the Subsidies

Identification Phase; Farmers apply for a digester to be built on their farm to CPO. CPO then asses the farmer and the site to analyze whether or not a digester is worth to constructing. For a digester paid using a credit mechanism, CPO which is usually also the dairy farmers cooperative will assess farmer's performance and history. If the assessment result shows a financially feasible location and condition for a digester to be built, then CPO will sent a report to PBPO to be approved. Later, the farmer will receive a digester registration number through a document called the Pre-Construction. PBPO will review the Pre-Construction document, signed, and sent to NBPSO to be included in database, and later, a digester ID number will be made. The ID number will be informed to CPO through PBPO. After receiving the digester construction ID, CPO

and the farmer will then sign a contract agreement about the digester construction. This contract is also called Household Agreement.

Construction Phase; after receiving ID number, and signing the Household Agreement, the digester construction process will be started by the CPO. Quality Inspector staffs of the PBPO will monitor the whole construction process. A completion report document will then be signed by CPO and the farmer upon completion. A warranty card and user manual will then be handed to the farmer. CPO is responsible to explain the user manual of the digester to the farmer. The digester is under a warranty for three years. Toolkit warranty is given for one year.

Subsidy Payment Mechanism; upon completion of the digester, CPO will send an invoice as well as a completion report to the NBPSO as a valid proof to apply for subsidy payment. NBPSO will then pay as much as one million and seven hundred thousand rupiahs of subsidy for every one digester built. Three hundred thousand rupiahs is withheld by BIRU until a post-construction report is submitted by the CPO, at least nine months upon completion of the digester for the first after sales service and eighteen months as the second after sales service [10][11].

E. Volume and Price of Digester

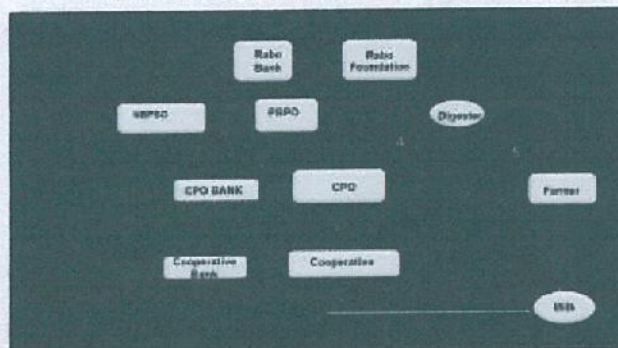
There are 6 type of digester that BIRU built based on volume and price (in million IDR) as of July 2017 as follows [12]

TABLE 3. VOLUME & PRICE OF DIGESTER

Type	2 m ³	4 m ³	6 m ³	8 m ³	10 m ³	12 m ³
Price	4	8	12	16	20	24

F. Credit Distribution Flow Mechanism

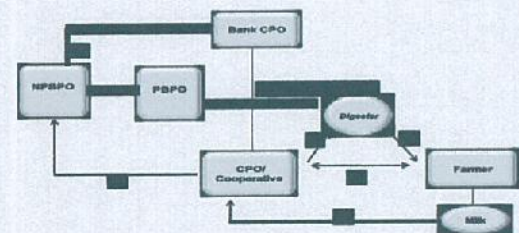
• Bank & Cooperative Collaboration



- (1) A Contract of work on construction of digester (agreement of household) between CPO and farmer is signed
- (2) CPO shall submit a bill to the cooperative to pay Down Payment (DP) 50% to start the construction of digester.
- (3) DP 50% will paid by Cooperative Bank to CPO from Rabobank Account.
- (4) CPO start to construct digester after DP is received.

- (5) The digester is completed and the gas is produce. Completion Report is signed by the CPO and the farmer.
- (6) CPO deliver Invoice along with supporting document to NBPSO for subsidy payment of two million rupiahs for one digester.
- (7) NBPSO verifies the proposed invoice with database (name of farmer, address, quantity and type). If it complied, then processed to the CPO Bank. NBPSO transferred one million and seven hundred thousand rupiah to CPO Bank. Three hundred thousand will be transferred if the CPO doing maintenance inspection on the ninth and eighteenth months after the digester is built.
- (8) CPO shall submit a bill to the Cooperative to obtain the digester repayment fund. The repayment invoice will be earned through CPO account at Rabobank.
- (9) Cooperative forward request from CPO funds to Rabo Bank. Funds disbursed to cooperatives is Rabo Foundation funds which deposited in Rabobank in accordance with their commitment to assist the BIRU program
- (10) Rabo Bank disburses funds to the CPO Bank in accordance with the request of the cooperative. CPO came to Rabobank to submit a letter of transfer request that has been signed (approve) the cooperative. Then Rabobank made a transfer to the CPO account at the request of the cooperative.
- (11) Farmers paid credit digester to the cooperative through deduction from the payment of milk purchases every month from the cooperative.
- (12) The Cooperative shall return the loan to Rabobank based on agreement. [5][8]

• Cooperative Only

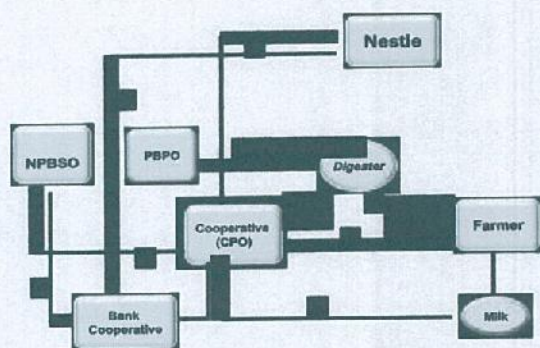


The explanation;

- (1) A Contract of work on construction of digester (agreement of household) between CPO and farmer is signed
- (2) CPO start to construct digester.
- (3) The digester is completed and the gas is produce. Completion Report is signed by the CPO and the farmer.
- (4) CPO deliver Invoice along with supporting document to NBPSO for the subsidy payment of two million rupiahs for one digester.

- (5) NBPSO verifies the proposed invoice, if the data is valid with database then the payment process is done to the Bank CPO. NBPSO transferred one million and seven hundred thousand rupiah to CPO Bank. Three hundred thousand will be transferred again if CPO perform maintenance visit (maintenance inspection) in the ninth and eighteenth months after the digester is built.
- (6) The payment of the remaining development of the digester is paid through the deduction of the dues (payment) of milk to the member farmer, or through cash in accordance with the loan agreement.[5][8]

- *Company Support (CSR)*



The explanations:

- (1) Contract agreement (household agreement) between CPO and farmer is signed
- (2) CPO build digester
- (3) Digester is completed and has issued the gas then the Completion Report (completion report) signed by CPO and ranchers
- (4) CPO sends invoices and is accompanied by a number of completion reports to NBPSO for submission of subsidy payment of two million rupiahs by one digester.
- (5) NBPSO verifies the proposed invoice, if it data is valid with the database then the process of payment made to the Bank CPO. NBPSO transferred one million nine hundred rupiah to CPO Bank. One hundred thousand will be re-transferred if CPO visits quality (quality inspection) at least six months after the built-in digester.
- (6) CPO (Cooperative) request funds to Nestle as reimbursement cost of digester.
- (7) Nestle transfer to CPO Bank
- (8) Payment of the remaining funds, is paid through the deduction of payment milk to the farmer. [5][8]

G. Economic Impact

- *LPG Replacement*

Household mostly used biogas as a replacement to firewood or 3 kg Liquefied Petroleum Gas (LPG) for cooking purposes. In many area farmers have reducing

consume of LPG in minimum in average 2-3 tube per month depend on volume of digester. Price of one 3 kg LPG tube around Rp. 15.000.000 till Rp. 25.000.000 depend on area.

- *Application Biogas Sector*

BIRU success to develop sector for biogas application like stove and lamp. Before BIRU running, mostly stove or lamp import from outside Indonesia. Nowadays stove and lamp and other biogas application produce in Indonesia

- *Interest Turnover*

The interest rate that charge to household consists of several type as follow [5];

- a) Cooperative; (1) cooperative with Bank (Rabo Bank); 12% per-annum. (2) Cooperative with CSR (Nesle); 0 %.
- (3) Cooperative Credit Union; 18 – 24% per-annum.
- (4) Cooperative with Cooperative; 12-24% per-annum.
- (5) Cooperative self funding; 2-% per-annum.
- b) Bank; 7,5% -12% per-annum
- c) Others Institution (KIVA); 0% and for 1 % for administration.

- *Economic Value of Bio-Slurry*

Bio-Slurry as residual product of anaerobic process is good used as fertilizer. Farmers can have additional income from selling bio-slurry per month Rp 50,000 to Rp 400,000.[6]

- *Carbon Trading*

The carbon credit mechanism is progressing. In 2015, a total 37,822.54 tCO2e is reduced from the construction of 14,219 unit digesters, or 105,878.64 tCO2e from the total 16,597 units installed. With this amount of emission reduced, the BIRU program is able to monetize the carbon credit and used it for further development of biogas sector in Indonesia.[6]

H. BIRU Non Finance Benefits

There are at least six benefits from BIRU that are related to non-finance as follows;

1. Family's health improvement due to the absence of smoke in the kitchen, reducing the number of respiratory infection patients, and several other diseases caused by environmental condition
2. Increase frequency time of parent (mother) and children together. Mother no need to looking for firewood for cooking anymore.
3. Bio-Slurry as an organic residue is a good fertilizer for agriculture or as food for fish. In addition Bio-slurry reducing usage of chemicals for agriculture or fisheries.
4. Create new jobs because biogas reactor constructions require the involvement of several businesses, such as brick production, welding workshops, etc.
5. Guarantees dairy cow populations stability and dairy supply to cooperatives and companies
6. Beef cattle populations' stability as well as a guarantee to industries or local community.

IV. CONCLUSIONS

As a first program on domestic biogas in Indonesia with payment mechanism, BIRU is success to develop the sector. Payment mechanism is sustained rather free mechanism.

Referring to Analysis and Conclusion, this research suggests; Company's CSRs can be utilized to help farmers in owning a digester, as long as it is not given for free; The high risk in BIRU financing is when a farmer's cow is ill or deceased, thus impact to possibility of credit failure. BIRU is expected to mitigate this risk by cooperation with insurance company.

The further research of comprehensive of socio-economic benefit from BIRU should be conducted in order to obtain value of project and replicate to similar program.

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- [12] Interview with Technical Officer YRE, Jakarta, 2017

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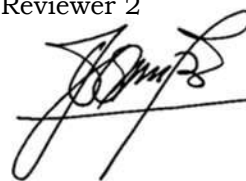
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