

## **Term of Reference Biogas User Survey and Kitchen Performance Test 2021**

### **1. Background**

The Indonesia Domestic Biogas Program (IDBP), or the BIRU (Domestic Biogas) program, is a development program implemented by Yayasan Rumah Energi (YRE) with national support from the Directorate General of New Renewable Energy and Energy Conservation. The objective of the IDBP is to deploy domestic biodigesters as a local, sustainable energy source through the development of a commercial, market oriented sector in Indonesia.

By 1 Oktober 2021, a total of 26.082 units bio-digester have been built in twelve provinces (Lampung, Banten, West Java, Central Java, DI. Yogyakarta, East Java, Bali, West Nusa Tenggara, East Nusa Tenggara, South Sulawesi, Central Sulawesi and Gorontalo). Plant construction and maintenance are the responsibility of Construction Partner Organizations (CPO) which are new or existing local organizations/SMEs. Currently around 40 CPOs are working under a partnership agreement with IDBP.

The Biogas User Survey (BUS) is an important instrument to measure the satisfaction rates of users towards biogas, to check the technical performance of the digesters and to use the result as the source of carbon monitoring of IDBP annually. The BUS also gives the programme management and stakeholders, including the users, good insights in the reliability and success of the biogas sector development approach as it is aimed on sustainable use of the biogas technology as introduced by the programme. The scope of BUS also encompasses user's profile, economic impacts from using biogas and its derivative, social and environmental impact. The data acquired during the survey will be used by YRE to be able to improve its approaches and amplifying impacts.

The functionality of the installed plants is an important aspect of the Programme, apart from the quantitative construction figures. In addition, various direct and indirect but important benefits enjoyed by the users of biogas technology may be taken into consideration. It is imperative to know in what degree the users of biogas, who are the ultimate beneficiary of the programme, have derived benefits from their plants and the program as a whole and to what extent they are satisfied with the technology. It is equally important to assess the socio-economic impact brought about by this technology. Thus, in order to obtain necessary feedbacks about the technology, it is essential to monitor both the technology and its impact on user satisfaction by conducting appropriate and detailed surveys at regular intervals.

IDBP has been registered as a Voluntary Gold Standard Program of Activities in 2013. Biogas User Survey 2021 must be done where all parameters that refer to indicators which are related to the SDG Impact monitoring under the Gold Standard for the Global Goals (GS4GG). The User Survey will therefore also be used a Carbon Monitoring Survey in line with the monitoring requirements set forth under the Gold Standard.

For this purpose, IDBP will engage an experienced and credible consultant to conduct the Users Survey for the current year 2021/22. For that reason the company will be engaged to undertake this 10<sup>th</sup> user survey after provided agreement is reached on price and contract conditions.

## 2. Objectives

### 2.1 General Objective

The main objective of the 10th Biogas Users Survey is to make a comprehensive assessment of the impacts of the biogas plants installed so far on energy, health & sanitation, and agricultural systems as well as technical, socio-economic, environmental and gender aspects. In addition to local impacts, the survey also should provide information to evaluate the environmental impacts of biogas plants and include the additional parameters needed to measure the carbon emission reductions and other SDG impacts by the programme as determined Gold Standard for Global Goals.

Apart from BUS activity that related with carbon monitoring, this year IDBP should be conducted a Kitchen Performance Test (KPT) to measure the amount of conventional cooking fuels (wood, LPG, etc.) on site that still used by the biogas household and a leakage assessment to assess whether neighbors of biogas users have increased their conventional fuel due to larger availability of those resources as their neighbors are not consuming the same.

## 3. Scope of Work

The scope of work will be to assess and analyses the following aspects of biogas:

- a. User profile (age, communication tool, annual income, etc)
- b. Impact on health and sanitation
- c. Impact on socio-economic conditions
- d. Technical performance of the biogas plants
- e. User's satisfaction and perception
- f. Impacts on gender
- g. Agricultural systems
- h. Energy, emission reduction and sustainable development impacts
- i. Excellence, efficiency, and effectiveness of biogas versus conventional fuel

The details of each of the aspects are as explained below.

### **A. User Profile**

Biogas user profile is relevant to capture the appropriate target market. The data will be used for YRE to develop the marketing strategy and access to information. Furthermore, user profile is essential in measuring the willingness and ability to pay of biogas users, decision making in investing in biogas, etc. The survey will focus on the following user profile :

1. User's age?
2. What media of communication does the user use?
3. Does the user have other jobs (other than dairy farming)?
4. How much is the annual or monthly income and from which source?
5. Who is the decision maker for investing in biogas?

### **B. Impact on Health and Sanitation**

Biogas reduces exposure to smoke and significantly improves air quality inside kitchen and also owing to the fact that biogas plant owners may choose to construct sanitary toilets, the survey will focus on the following health related issues:

1. Do they have new kitchen for cooking?
2. The cleanliness of kitchen after having biogas plant.
3. Exposure to indoor air pollution and reduction of smoke in the kitchen due to biogas
4. Respiratory and eye infection
5. Incidence of gastro-intestinal diseases
6. Mosquito induced diseases and nuisance
7. Fire/burning accidents.
8. General physical condition (stress, free time, time for feeding etc) among women, men and children

### **B. Impact on Socio-economic Conditions**

As biogas reduces fuel expenses for cooking and lighting and also saves significant time spent in collecting fuel wood and other cooking fuels, this has economic and social implications. Issues relating on socio-economic implications will be focused on the following aspects:

1. Time and money saved through different household and biogas related activities (specifically how much money is saved by not having to purchase fuels and what do they do with the saved money? For saving or education needed or other needed?)
2. How much percentage of the saving by using biogas from the overall expenses of the users monthly?
3. How much time needed per day to operate, maintained and produce biogas per day?
4. Use of the saved time in different income generating activities.
5. Employment generation
6. Determination of economic level of biogas owners
7. Financing source for biogas plants
8. Educational status of household members
9. Economic level of household
10. Perception on economic value of their livestock after having biogas plant.
11. Economic value of bio-slurry
  - a. Selling bio-slurry as raw material.
  - b. Selling bio-slurry as modified product.
  - c. Total income from selling bio-slurry.
  - d. Increase agricultural production that using bioslurry.
  - e. Total reduce cost of chemical fertilizer.
12. As part of this survey the following question shall be included: "Do you feel that your living conditions have a) improved, b) stayed the same, c) worsened; since the installation of the biogas digester?"

### **C. Technical performance of the Biogas Plants**

The followings are biogas plant related information to be assessed:

1. Instruction on operation as provided by the Construction Partner Organizations (CPOs)
2. Operation and maintenance of the biogas plant including trainings
3. User participation in promoting the benefit of biogas to other; target audience and occasion they used for promoting biogas plant.
4. Plant operation rate, problem/hindrance and maintenance cost, specifically a) how many days during the year the digester was not operational, and why and b) what the drop-off rate is and the reason for this
5. Awareness about safety measures in operation and maintenance

6. Non technical problems faced by the users
7. Dung availability per day and burning hours of biogas stove
8. Functioning rate of biogas plants

#### **D. Users Satisfaction and Perception**

Perceptions of the biogas users with regards to the following relevant issues will be assessed:

1. Their suggestions for possible improvement
2. Operation and maintenance training received by them
3. Means of communication on biogas (consultation and complain mechanism)
4. Satisfaction/ dissatisfaction : overall satisfaction, satisfaction toward construction design and biogas equipment's, like : lamp, stove, gas, tap, water drain, main pipe, nipple gas, mixer, inlet, manometer)
5. The most valuable benefit of having biogas plant
6. What made users decide to invest in biogas?
7. Sources of biogas information or where did they get the information on biogas prior to becoming a user?
8. Person in charge or contacted for repairing and maintenance.
9. Satisfaction towards the overall service by CPO

#### **E. Impacts on Gender**

Since biogas provides direct benefit to rural women especially, as a result of the reduction of workload, following gender related issues will be assessed:

1. Women's participation in decision making process
2. Involvement of women in construction, operation, maintenance and management of biogas plant
3. Technical know-how of either men or women
4. Benefits derived by the women and children from the installation of biogas plant
5. Health and workload change before and after biogas installation
6. Income generation and productive work conducted by women after using biogas
7. Women's involvement in social activity from time saved after using biogas
8. Time involvement of women VS men in household chores like cooking, feeding, fuel wood collection, operation of biogas plant, etc.
9. If you can save moneys or create other income from having biogas plant; who will manage the money?
10. The number of women attending trainings (including the Operation and Maintenance trainings)

#### **F. Agriculture Impacts**

The prime source of raw material for biogas is the livestock/ poultry; and the digested slurry is considered a high quality manure. Impacts of biogas on two major components of the Indonesian farming systems, viz. livestock and crop/vegetables, will be assessed by considering following issues;

1. Cattle (Livestock) population, grazing method (openly grazed /stall fed), shed management, animal health, fodder management etc
2. Changes in the above practices after the installation of biogas

3. Slurry use pattern and their effectiveness on crop growth, soil fertility and crop productivity and ultimately the farm income
  - a. Number of users applying the final bio-digester slurry on agricultural land
  - b. Reduction in the use of chemical fertilizers after using bio-slurry (in volume, please mention the replaced type of chemical fertilizer).
  - c. Form of bio-slurry use in farming (dried / liquid).
  - d. Treatment of slurry which are not used as modified products and/or applied for agricultural purposes and/or selling.
  - e. Effect on productivity and cultivation of new crops

### **G. Energy, emission reduction and environmental Impacts**

Biogas reduces the pressure on forests and alleviates deforestation as an average family size of biogas plant is considered to save more than 2.0 tons of fuel wood per annum. The digested slurry is an excellent source of bio- fertilizer that can significantly improve soil fertility and crop productivity. Besides, biogas can significantly reduce the level of Green House Gases emission in the environment. While assessing the energy and environmental benefit, major focus will be given on the following issues:

1. Fuel usage before implementation of bio-digester: Household daily utilization of fire wood, agriculture residues, animal dung, kerosene, LPG for cooking expressed in kg/day/household.
  - a. Fuel usage after implementation of bio-digester: Household daily utilization of fire wood, agriculture residues, animal dung, kerosene, LPG for cooking expressed in kg/day/household;
  - b. Type of stove used.
  - c. Daily gas production and consumption.
2. Local (household) environmental condition before and after the installation of biogas and its impact on global environment.
3. The number of animals kept by the household, per type.
4. The manure storage methods, as per the definitions of the methodology.
5. The animal housing methods.
6. The usage rate, weighted based on drop off rates that are representative of the age distribution for project technologies in the total sales record\*.
7. Fraction of manure produced per animal type that is fed into the bio-digester.
8. Fraction of manure produced per animal type that is not fed into the bio-digester.

### **H. Kitchen Performance Test**

The objective of the KPT is to obtain reliable fuel use data of project and equivalent baseline households, i.e. households with and without a biodigester. The baseline performance field tests (BFT) and project performance field test (PFT) measure real, observed technology performance in the field. Consumption is measured with a representative sample of end users under each defined baseline scenario (in the absence of the project technology) and project scenario.

The KPT shall be executed according to this protocol:

- Test period shall be 1 days<sup>1</sup> = the measurement campaign (MC).
- The selected test day will span fuel measurement consumption for human food cooking and boiling water totaling 24 hours.
- Cooking practices shall be during 'normal days'. Normal days are defined as periods without extra eaters. Depending on the family, this excludes days like festivals or holidays or weekend days. The MC can take place in the weekend if it can be proven that fuel use is not higher during these days (i.e. the same number of people eat meals as during the week).
- Households are instructed that they cook normally during the test. The aim is to capture their usual behavior in the kitchen, as if no tests were happening, to feed the usual variation of people with the usual variation of food types.
- To conduct the tests, ensured is that the cook uses fuel only from a designated stock which is pre-weighed.
- During the tests, surveyor is to find out how many people have eaten and how many meals each, with the data to be entered into the data sheet as the number of "person-meals" (individual meals as opposed to meals shared) cooked with the weighed fuel each day. Note that this count can include meals sold commercially as well as meals consumed in the domestic environment. The number of people eating meals shall be recorded using the following categories: Child 0-14 years, Female over 14 years, male 15-59 and male over 59 years old.
- It is important that the fuel is typical of the fuel normally used through the year, particularly in terms of moisture content.

For further reading the Consultant can consult Annex 4 of the Gold Standard TPDDTEC methodology v3.1 (with application of INDEPENDENT sample for Project Fuel Test combined VPA-1 and VPA-2, and Baseline Fuel Test only for VPA-2; and a measurement campaign of 24 hours instead of 3 days).

[https://globalgoals.goldstandard.org/standards/407\\_V3.1\\_EE\\_IC\\_S\\_Technologies-and-Practices-to-Displace-Decentralized-Thermal-Energy-TPDDTECConsumption-.pdf](https://globalgoals.goldstandard.org/standards/407_V3.1_EE_IC_S_Technologies-and-Practices-to-Displace-Decentralized-Thermal-Energy-TPDDTECConsumption-.pdf)

## I. Leakage assessment

The aim of the leakage survey is to determine whether fuel use has changed because a neighbour installed a biogas digester. It is therefore important for the surveying team to stress the fact that their neighbour has a biodigester to establish causality. In a first question for instance, you should not ask in general if the household has changed its cookstove type but whether the household has a new stove because the neighbour has a biodigester now (i.e. proof of causation). In case fuel use has increased, it must be possible to quantify the increased amount. Therefore it is essential that the equivalent fuel amounts in kilograms (kg) per week are provided for the different fuel types specified in a second question.

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<sup>1</sup> A MC of 1 days (24 hour) is allowed by the Gold Standard

#### 4. Approaches and Methodology

The Consultant should mention the detailed approaches and methodology for carrying out this study. But methodology shall include the desk study and review all the relevant literature related to user's survey. Based upon the review of the literatures, the consultant shall formulate the tools of data collection such as structured questionnaire, and areas of operation which shall be finalized in agreement with IDBP.

The BUS will have a minimum sample size of minimum 360-420 biogas households<sup>2</sup> of 10 provinces (West Java, Banten, Central Java-Yogyakarta, East Java, Bali, Nusa Tenggara Barat (Lombok), Nusa Tenggara Timur (Sumba), South Sulawesi and Lampung constructed from 2009 to June 2021.

Random sampling shall be done based on IDBP database representing various sizes and age, both cow dung and/or pig dung plants and other parameters set by the Gold Standard. Based upon the database available from IDBP, the consultant shall prepare a detailed list of randomly selected 360 - 420 households (with biogas) in the 10 survey provinces.

The minimum 360 – 420 households selected sampling should distinguish between the Biogas User Survey (BUS) called Carbon Monitoring Survey by the Gold Standard, and the Usage Survey (US). For the BUS will need a large questioner, and for the US will need short questioner. Other than that there will be minimum 129 households to be interviewed in KPT and 140 households to be interviewed on Leakage Assessment

To ensure conservativeness, participants in a usage survey with technologies in the first year of use (age 0-1) must have technologies that have been in use on average longer than 0.5 years. For technologies in the second year of use (age 1-2), the usage survey must be conducted with technologies that have been in use on average at least 1.5 years, and so on.

The sampling selection number will be based on this age of usage:

	Survey	Year of use												Total	
		VPA-2					VPA-1								
		Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12		
1	BUS Survey	30	30	30	30	30	30	30	30	30	30	30	30	30	360
2	KPT – Biogas users	8	8	8	8	8	7	7	7	7	7	7	7	7	89
3	KPT – Non Biogas users	8	8	8	8	8									40
5	Leakage assessment	20	20	20	20	20	20	20							140
														<b>Total</b>	<b>689</b>

The consultant shall organize an intensive training for the members of field survey team prior to the pre-testing of questionnaire and field mobilization. The consultant shall prepare a detailed programme regarding the mobilization of survey team for field studies and will submit a copy to IDBP Jakarta to enable it to monitor the activity in the field.

<sup>2</sup>) The minimum number of valid responses is 30 per age group. It is up to the contracted party to decide on oversampling to achieve this number.

## 5. Expected Output

- Inception Report
- Draft Report and
- Final Report

The report of the survey should provide comprehensive analysis aspects of biogas stated in the scope of work

After submission of the draft report, the Consultant shall organize a consultative workshop to present the findings of the study among the stakeholders and to get comments and suggestions, in consultation with IDBP. In the final report, the Consultant should clearly mention the methodology, output of the study and recommendations based on the study by incorporating the comments and suggestions received from the stakeholders. Two copies of printed final report (in English) and an electronic copy (in usb/hardisc) must be submitted to IDBP. The reports must be prepared and performed in a professional way by adhering to strict quality standards.

## 6. Work Schedule

The works schedule of the Survey will be like this:

No.	Activity	2021							2022							
		November			December				January				February			
		W-II	W-III	W-IV	W-I	W-II	W-III	W-IV	W-I	W-II	W-III	W-IV	W-I	W-II	W-III	W-IV
1	Finalized ToR															
2	Advertise the ToR															
3	Q&A session with interested applicants															
4	Received Proposal from the candidate															
5	Interview the candidate															
6	Select and Contract with the Consultant															
7	Training of Enumerator															
8	Field Survey															
9	Processing data															
10	Analysis and reporting															

The consultant shall elaborate detail work schedule to be carried out for implementation of the proposed programme. But the actual time will be determined after the agreement between IDBP and the Consultant. **The draft report expected to be received in the 4<sup>th</sup> week of February 2022. And the final report expected to be received in the 2<sup>nd</sup> week of March 2022.**

## 7. Team Composition

Only consultancy firm or an institution with legal entity is allowed to apply. The team should be composed of :

- Socio-Economist having at least 5 (five) years professional experience.
- Certified statistician having adequate experiences

The Consultant shall submit the name(s) of the required human resources to be assigned for execution of the proposed project. The detailed CVs of the experts to be involved for the conduction of this study must be submitted with their original signature and their commitment to provide the full time for this study.

## 8. Proposal

The Consultant will prepare a proposal based on the above specification which will be part of this TOR and the contract with YRE. The proposal should be received by YRE at 30 November 2021 at the latest.

## 9. Q&A session

Q&A session will be hosted by YRE on the 24<sup>th</sup> of November 2021. For interested applicants who has further queries, kindly attend the Q&A session by sending a request for Zoom invitation to [info@rumahenergi.org](mailto:info@rumahenergi.org) with the subject email: BUS 2021 applicant

## 10. Budget line

The total budget for the consultancy work is IDR. 450.000.000 (four hundred and fifty million rupiahs). A withholding (WTH) tax article 23, 2% from the service fee will be deducted and be paid to the Indonesia tax authority.

## 10. Payment to consultant

The payment will be divided into two parts:

First payment 50%: after a contract is signed and the copy is returned to YRE with bank details, in 1<sup>st</sup> week of December 2021.

Final payment 50%: after the final report is submitted and approved by YRE, in the 4<sup>th</sup> week of February 2022. A withholding (WTH) tax article 23, 2% from the service fee will be deducted and be paid to the Indonesia tax authority.

## 11. Termination of Contract

In the event that work progress or quality is not satisfactory, IDBP shall have the right of withdrawing the contract partly or wholly. Justification for such action will be provided in writing. The portion of the contract value that has not been paid when such action is taken will be retained in IDBP as liquidated damages.