

FINAL GENERAL REPORT

FOR

Biogas User's Survey 2017/18 for Nepal Biogas Support Program-PoA CDM Program Activity-4 (CPA-4)

UNFCCC REF: PoA9572



Submitted To:

Alternative Energy Promotion Centre
Khumaltar Heights, Lalitpur Nepal
Tel: 977-1-5539390
Email: info@aepe.gov.np
Website: www.aepe.gov.np

Submitted By:

Prakriti Consult (P) Ltd.
Baneshwor – 10, Kathmandu
Tel: 977-1-2298708
E-mail: info@prakriticonsult.com.np
Website: www.prakriticonsult.com.np

June 2018

Acknowledgement

Prakriti Consult Pvt. Ltd., express sincere gratitude to Alternative Energy Promotion Center for entrusting us to conduct the Biogas User's Survey 2017/18 as a part of monitoring of CDM project activities and Program of Activity (PoA) for Biogas. We would also like to thank Mr. Ram Prasad Dhital, Executive Director of AEPC for providing us with this opportunity. We would specially like to thank Mr. Rana Bahadur Thapa, Sr. Officer and Mr. Prem Kumar Pokhrel, Climate and Carbon Expert of AEPC for their guidance and suggestions during the entire study.

This study is an outcome of numerous interactions with large number of professionals and individuals. All the surveyed biogas users are highly acknowledged for their sincere responses support during field investigation.

Madhav Giri, PhD
Managing Director
Prakriti Consult Pvt. Ltd.
Baneshwor, Kathmandu

TABLE OF CONTENTS

Acknowledgement	i
TABLE OF CONTENTS.....	ii
CHAPTER I: INTRODUCTION	1
1.1 Background	1
1.2 Historical Perspective	1
1.3 Context of the Present Study	1
1.4 Objectives	2
1.5 Scope of Works	2
CHAPTER-II: APPROACH AND METHODOLOGY	3
2.1 Desk Review	3
2.2 Sampling Methodology	3
2.2.1 Objectives and Reliability Requirements:	3
2.2.2 Target Population:	3
2.2.3 Sampling method	3
2.2.4 Sample size	4
2.2.5 Sampling frame	5
2.3 Questionnaire Preparation and Enumerator Selection	5
2.4 Pre-testing of the questionnaire	5
2.5 Field Work	6
2.6 Data Coding, Processing and Analysis	6
2.7 Quality Assurance/Quality Control (QA/QC)	6
2.8 Documentation and Reporting	6
CHAPTER-III: SURVEY RESULT	7
3.1 Operational Status	7
3.2 General Household Characteristics	7
3.3 Energy Use	8
3.4 Operation and Use of Biogas	10
3.5 Benefits of Biogas on Sustainable Development Indicators	11
CHAPTER-IV: CONCLUSION	17

Annexes

Annex-1	List of Biogas users sampled for the study
Annex-2	Questionnaire
Annex-3	Orientation Schedule

ACRONYMS

AEPC	Alternative Energy Promotion Centre
BSP	Biogas Support Program
CCU	Climate and Carbon Unit
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CPA	CDM Program Activity
DOE	Designated Operational Entity
EB	Executive Board
GHG	Greenhouse Gas
GS	Gold Standard
MR	Monitoring Report
NRB	Non Renewable Biomass
PDD	Project Design Document
PoA	Program of Activities
QA	Quality Assurance
QC	Quality Control
RET	Renewable Energy Technology
SPSS	Statistical Package for Social Surveys
ToR	Terms of Reference
UNFCCC	United Nations Framework Convention on Climate Change

Executive Summary

This Biogas Users' Survey (BUS) 2018 is aimed at assessing the benefits from biogas plants monitoring as envisaged in the Gold Standard Passport. Such benefits mainly include households having access to toilets, impact on bio slurry, environment, health and sanitation as envisaged in the PDD. For this purpose 135 biogas users were selected randomly representing 11 districts, 5 different regions and 3 ecological belts. They were asked questions about how they used the biogas plant and the kinds of economic and health benefits that they reaped from the use of the biogas plant.

Summary of Main Findings

- 135 households were surveyed and out of them 73.72% were found to be operational. Among the households having operational digesters, 69% reported that they use firewood as alternative fuel to the biogas and 71 % out of that reported that the firewood is used as alternative fuel for cooking.
- Survey revealed that the average operation of biogas plant is above 2 hours per day which is sufficient to cater the household cooking needs.
- All of the survey households agreed on the fact that the biogas digesters have resulted in reduction of the indoor smoke. More than 90% households reported to have perceived reduction in incidences of smoke related diseases like eye infection and respiratory diseases whereas 87% claimed that cough problem is reduced. Similarly. 96% reported that fire related injury has been reduced.
- Survey respondents reported that the use of biogas has resulted in time saving for the collection of firewood. The users reported such reduction in 99% of cases in men and 100% of cases in women. Most of the respondents (82%) reported using the saved time in working in their farmland, by cleaning house (75%), recreational activities (17%), social activity(46%), helping children in their study (73%), and engaging in income generating activities (40%).
- All households reported that they use the bio-slurry as manure in their farms. Of these, 9% reported to having used it slurry as it is, 62% reported to having used it after composting while 29% reported to having used it after drying. On the productivity improvement side, 95% households reported an increase in productivity after the use of slurry while 2% reported no effect.
- Toilet construction was observed in all of the households surveyed. In majority of cases (80%) toilet construction was done after the construction of biogas. Among all households having toilet constructed, 79% households had toilets connected to their digester. The reason behind not connecting toilet to the digester, as reported by the users, was basically due to not receiving any suggestion from company (81%).

CHAPTER I: INTRODUCTION

1.1 Background

Alternative Energy Promotion Centre (AEPC) has commissioned Prakriti Consult Pvt. Ltd., a private consulting company incorporated in accordance with the Company Act 2006 (section-5(1)) through a competitive bidding process to conduct “Biogas Users’ Survey 2017/18 for Nepal Biogas Support Program PoA” on January 19, 2018. This draft report is being prepared in accordance with the contract signed between the parties to fulfill the reporting requirements stipulated in “appendix F” of the contract.

1.2 Historical Perspective

Alternative Energy Promotion Centre (AEPC) is a national executing agency of renewable energy programs and projects in Nepal under the Ministry of Population and Environment. With the mandate of policy and plan formulation, technology innovation, resource mobilization and coordination and quality assurance, the mission of AEPC is to make renewable energy a mainstream resource through increased access thereby, contributing for the improved living conditions of people in Nepal.

Introduction of biogas technology in Nepal dates back to 1955 while the Government of Nepal (GoN) initiated a dedicated program on biogas technology in 1975. Despite government’s effort, momentum in the sector was realized only since 1992 when the Government of the Netherlands established Biogas Support Programme (BSP) to organize the ongoing efforts in biogas sector. With the establishment of AEPC in 1996, more concerted efforts were taken to promote the biogas technology. Since 1996, the sector development was more visible with growing number of construction companies, manpower trained, and government’s priority with introduction of rural energy policy and subsidy policies.

AEPC promotes an array of renewable energy interventions in Nepal; from rooftop solar to hydro and improved cooking stoves to large scale commercial biogas. Apart from its mainstream business of promoting renewable energy technologies and other measures to enhance livelihood of the unreached segment of the society, AEPC has unleashed opportunities for the renewable energy projects it has promoted to get the emission reduction entitlements. As a result, AEPC has developed eight Clean Development Mechanism Projects/Programs across biogas, micro-hydro, improved cooking stoves and improved water mill technologies. By far, AEPC has managed to issue around 2 million tons of certified emission reductions (CERs). Tradability of CERs in the international compliance market created as a result of commitment made by the member of conference of parties under the convention to its Kyoto Protocol (second commitment period) is one of the income sources that support sustainable operation of the systems bundled under different projects/programs.

Biogas technology enables to optimally use methane for meeting the household energy requirements, avoid the use of non-renewable biomass for cooking purposes and helps to reduce the concentration of GHG in the atmosphere. AEPC is committed to updating knowledge on Climate Change mitigation and adaptation options; further development of a diversified portfolio of Renewable Energy Technologies (RETs) projects using different instruments and establishing high quality performance assurance and monitoring systems. In July 2010, a Carbon and Climate Unit (CCU) was established in AEPC with responsibility to carry out the activities related to climate change and to tap carbon trade opportunities while promoting RETs in Nepal.

1.3 Context of the Present Study

Kyoto Protocol, an international agreement linked to the United Nations Framework Convention on Climate Change (UNFCCC), which commits its Parties by setting internationally binding emission

reduction targets came into existence in 1997. The Clean Development Mechanism (CDM), defined in Article 12 of the Protocol, allows a country with an emission-reduction or emission-limitation commitment under the Kyoto Protocol to implement an emission-reduction project in developing countries. Realizing the importance of biogas technology in avoiding the use of non-renewable biomass and its role in reducing the emission of GHG in the atmosphere, and realizing the opportunities of such technologies in the international carbon market regime, AEPC initiated its first Clean Development Mechanism (CDM) project in Biogas. AEPC succeeded in registering its first Clean Development Mechanism (CDM) Project Activity (PA) in biogas on 27th December 2005. Similarly, the programmatic framework on the biogas technology was registered with the UNFCCC on 31st January 2013.

CDM principles focus on the sustainability of the systems being deployed as CDM projects and their contribution in the sustainable development. Apart from the physical implementation, continuous functioning of the installed plants is crucial measure of success of the technology and the program as a whole. It is also imperative to know how far the users of biogas have derived benefit from their plants and the programme as a whole and to what extent they are satisfied with the technology. It is equally important to assess socio-economic impact brought about by this technology. To assure that these things are delivered to the households, it is essential to monitor both the technology and its impact on user satisfaction by conducting surveys at regular intervals.

Monitoring of the systems deployed is one of the key steps of the CDM project cycle procedure and required for a project to generate tradable emission reductions. It is therefore essential to monitor the parameters that are envisaged as monitoring parameters while designing the project. In this backdrop, AEPC entrusted the Prakriti Consult Pvt. Ltd. to conduct the emission reduction monitoring of Nepal Biogas Support Program PoA.

1.4 Objectives

The objective of the assignment was to assess the delivery of the community benefits envisaged during the program formulation. More specifically the following objectives are addressed by the study.

- Assess the users' perception over reduction in indoor smoke and incidence of disease after biogas plant installation
- Assess the users' perception over time saving after biogas plant installation
- Assess the number of beneficiary households that have access to toilets
- Assess the use of bio-slurry as replacement to chemical fertilizers and ultimate change in productivity

1.5 Scope of Works

The scope of works as stipulated in the terms of reference (ToR) floated by the client along with the request for proposal (RFP) includes the following:

- Individual surveys for the Biogas CDM CPA-4 relevant to monitoring of sustainable development indicators as per the Gold Standard.

CHAPTER-II: APPROACH AND METHODOLOGY

2.1 Desk Review

The consultant conducted preliminary desk review to get better insight of the monitoring assignment. The consultant reviewed the registered PDD and the latest verification report submitted EPIC Sustainability services, the DOE performing the verification of the project for the vintage 01 August 2015-31 July 2016. The verification report doesn't recommend any forward action request (FAR) to be considered in the successive monitoring. While the baseline and monitoring methodology has been revised, this doesn't trigger any change for project monitoring.

2.2 Sampling Methodology

This methodology for sampling has been developed in compliance with the monitoring methodology envisioned in annex 04 of the registered PoA-DD. Since the methodology is applicable for all the CPAs under the PoA, the same has been used throughout.

2.2.1 Objectives and Reliability Requirements:

The sampling objective is to obtain a reliable estimate of the key variables used in the estimation of emission reductions. The monitoring would be performed using the level of precision of 10% and a confidence level of 90%. The monitoring plan aims determining the parameter "p" which is the number of digesters implemented that is in operation and therefore continues to displace the non-renewable biomass. Emission reductions are directly proportional to the number of biogas digester that is operating. This will be done through performance reports and a sample of appliances to ensure that they are operating or are replaced by an equivalent in service appliance.

2.2.2 Target Population:

The target population is the households using biogas digesters under CPA-4 throughout Nepal. Table 1 depicts the number of biogas digesters implemented in each ecological zone under CPA-4 which is the target population for this study.

Table 1: Target Population for CPA-4

SN	Ecological Zone	Number	Percentage
1	Remote Hill	123	0.62
2	Hill	10720	53.68
3	Terai	9127	45.70
	Total	19,970	100

2.2.3 Sampling method

Stratified random sampling is applied to conduct the monitoring survey. An adequate sample size has been chosen in order to meet 90/10 precision (90% confidence interval and 10% margin of error) for parameter values used to determine emission reductions.

Thus each CPA was monitored on a sample of biogas digesters included in that CPA. The design of biogas digester (GGC 2047 model) disseminated under each CPA of the PoA is same throughout the country. Nevertheless, the location of households using biogas digesters in different ecological zones create heterogeneity and justifies the choice of opting stratified random sampling.

2.2.4 Sample size

The sample size is determined using the Standard for Sampling and Surveys for CDM Project activities and Programme of Activities stipulated in the registered PoA-DD. The level of precision of 10% and a confidence level of 90% shall be assessed for the relevant parameter (P).

The minimum sample size is calculated using the procedure outlined in annex 04 of the registered PoA-DD and adhering to the sampling standards and sampling guidelines recommended by the UNFCCC CDM executive board.

$$n \geq \frac{1.645^2 NV}{(N-1) \times 0.1^2 + 1.645^2 V} \text{----- Equation 1}$$

$$V = \frac{SD^2}{\bar{p}^2}, \text{----- Equation 2}$$

SD^2 is the overall variance and
 \bar{p} is the overall proportion.

$$SD^2 = \frac{(g_a \times p_a(1-p_a)) + (g_b \times p_b(1-p_b)) + \dots + (g_k \times p_k(1-p_k))}{N} \text{----- Equation 3}$$

$$\bar{p} = \frac{(g_a \times p_a) + (g_b \times p_b) + \dots + (g_k \times p_k)}{N} \text{----- Equation 4}$$

Where,

g_1 = total number of plants in Remote Hill installed in different CPAs

p_1 =Operational status of plants in Remote Hill in different CPAs

g_2 =total number of plants in Hill installed in different CPAs

p_2 = Operational status of plants in Hill in different CPAs

g_3 = total number of plants in Terai installed in different CPAs

p_3 =Operational status of plants in Terai installed in different CPAs

N = Total number of digesters implemented under the CPA

p = our expected proportion across all ecological zones

The expected proportions across the ecological zones are taken from the outcome of previous Biogas User Survey 2016-17 for CPA-4. The operational status of the biogas in Terai, Hill and Remote Hill were 100%, 78.26% and 25% in FY 2016/17. Based on this value, the sample required is calculated as 33. To maintain the non-response rate and inline with the previous user survey, the sample size is increased. However, the minimum number of samples to be surveyed in each ecological zone has been benchmarked as “4; therefore the total number of samples surveyed for the purpose of the monitoring assignment is taken as 135 as the most conservative figure.

Table 2: Sample requirement and sample distribution across strata

Symbol	Description	CPA-4
g_1	total number of plants in Remote Hill	123
p_1	Operational status of plants in Remote Hill	25%
g_2	total number of plants in Hill	10720
p_2	Operational status of plants in Hill	78.26%
g_3	total number of plants in Terai	9127
p_3	Operational status of plants in Terai	100%
N	total number of plants under specific CPA	19970
SD^2	Overall variance	0.09
\bar{p}^2	Overall proportion	0.88
V		0.12
n	required sample size for each CPA	33
Minimum Sample size	Remote Hill	1
	Hill	18
	Terai	16

	Adjusted Sample size for this CPA	135
	Remote Hill	4
	Hill	69
	Terai	62

2.2.5 Sampling frame

The sample frame consists of selection of households using biogas digester units disseminated under each CPA of the PoA across different PSUs selected from the ecological zone and development region matrix. The sample to be surveyed is drawn randomly from the population of biogas digester distributed in each stratum (i.e. remote hill, hill and terai) spread within the project boundary of the PoA. The list of households selected for the survey is presented in **annex-1** of this report.

Table 3: Sample requirement across different PSUs in CPA-4

Cluster	District	PSU	Cluster total	Percent	Sample	Adjusted No.	Total Sample	% of Total Sample
EDR-RH	Solukhumbu	Tingla-8	92	0.46%	1	3	4	3%
EDR-HI	Udaypur	Katari-8	905	4.53%	6	0	6	4%
EDR-TE	Sunsari	Bharaul-1,3,4,6	1499	7.51%	10	0	10	7%
CDR-HI	Nuwakot	Duipipal-7	4891	24.49%	33	-3	30	22%
CDR-TE	Chitwan	Kunroj-9	1736	8.69%	12	0	12	9%
WDR-RH	-	-	2	0.01%	0	0	0	0%
WDR-HI	Tanahu	KahuShivapur-1	4490	22.48%	30	-5	25	19%
WDR-TE	Nawalparasi	Benimanipur-3	1067	5.34%	7	0	7	5%
MWDR-RH	-	-	19	0.10%	0	0	0	0%
MWDR-HI	Surkhet	Latikoili-3	402	2.01%	3	1	4	3%
MWDR-TE	Bardiya	Neulapur-2,3	2446	12.25%	17	0	17	13%
FWDR-RH	-	-	10	0.05%	0	0	0	0%
FWDR-HI	Doti	Dipayal NP-5	32	0.16%	0	4	4	3%
FWDR-TE	Kanchanpur	Rampur Bilaspur-1	2379	11.91%	16	0	16	12%
Total			19970	100.00%	135	0	135	100%

2.3 Questionnaire Preparation and Enumerator Selection

Survey questionnaire was prepared to accommodate all the monitoring parameters included in the PoA and the respective CPAs including the monitoring parameters related to Gold Standard for the first four CPAs. The survey questionnaires administered during past surveys have been referenced and there are not significant changes in the questionnaire administered. The survey questionnaire proposed for the monitoring assignment is presented in **annex-2** of this report.

Enumerators were cautiously selected and orientated, as appropriate, prior to field mobilization to share lessons learnt from earlier studies as well as to develop a common understanding among the survey team about the purpose, methodology and intended outcomes of the current survey. The orientation shall acquaint the enumerators with monitoring requirement and approach they should adopt while performing the survey. In addition, general working modality of biogas plant, factors affecting biogas production and troubleshoot measures for simple problems encountered while using biogas shall be delivered to the enumerators to tackle some field based complications while performing the survey.

2.4 Pre-testing of the questionnaire

The survey questionnaire was administered to the households as a part of pretest exercise. Pre-testing was conducted in Sudal VDC of Bhaktapur district on 13th February 2018 where a guided

questionnaire filling exercise was conducted. Inconsistencies in the questionnaire were corrected the same was administered for monitoring survey. In order to optimize time, the questionnaire focused on the monitoring parameters required by the monitoring plan of the PDD and SD indicators required by the GS.

2.5 Field Work

After approval of inception report and detailed work plan presented therein, the consultant mobilized enumerators in the field. The field work was conducted from 20th February 2018 to 22nd March 2018. During the field work the enumerators recorded the information based on their observation or as reported by the respondents.

2.6 Data Coding, Processing and Analysis

The data recorded by the enumerators were coded appropriately for identification. Data entry was conducted using MS-Excel and final analysis was conducted with aid of Statistical Package for Social Surveys (SPSS). After the survey, the data from the survey was analyzed to determine the percentage of digesters operational in a year from among the digesters implemented and to confirm the status of continued use of the NRB.

Emission reductions are directly proportional to the number of appliances (biogas digester units in case of the project) that are operating. The calculation of emission reduction was done using excel sheet. The values of parameters (percentage of digesters operational in a year, displacement of NRB, quantity of woody biomass substituted, leakage from the digesters, etc) was calculated using excel sheet which determined the emission reductions from all digesters included in the project. On this basis a monitoring report was prepared.

2.7 Quality Assurance/Quality Control (QA/QC)

As discussed above, pre-test exercise was adopted as a measure to overcome the survey biases. This exercise helped enumerators avoid their confusion while filling in the questionnaire, to minimize data errors and possible data collection as well as compilation errors. Furthermore, the enumerators were trained to self assess the filled-in information at the end of the day to correct any possible mistakes or inconsistencies encountered.

To avoid the error at data entry level, trained data recorders with past knowledge in recording social survey data were deployed under the direct supervision of the statistical expert. Statistician prepared recording formats and standard data recording procedure to minimize human errors during data recording.

2.8 Documentation and Reporting

After the compilation of the survey findings, required reports were prepared as stipulated in the terms of reference of the assignment. The emission reduction monitoring report is prepared in addition to the monitoring report (MR) as per the requirement of UNFCCC.

CHAPTER-III: SURVEY RESULT

3.1 Operational Status

Assessment of the operational status of the biogas digesters is the critical parameter for monitoring according to the monitoring plan of the registered PDD. As revealed by the survey outcome, operational status of the biogas digesters that were surveyed is presented in Table 4. The assessment of the operational status of the digesters was based on the criteria set out in the survey questionnaire administered to the households. Overall around 73.72% of the biogas digesters were found to be operational considering the overall population.

Table 4: Operational Biogas

Ecological Belts	Functional Status			
	Yes	Percentage	No	Percentage
Remote Hill	3	75.00	1	25.00
Hill	43	62.32	26	37.68
Terai	54	87.10	8	12.90

Source: Biogas user's survey 2018

Based on the operational status and the sample taken, reliability of the survey was checked. The precision for the survey data was calculated as 8.2 % which is below the 10% of the assumed precision level. So, the reliability of the survey data has been met.

Biogas users' were further asked to state the reasons why they abandoned the use of the biogas plant and the results are summarized in Table 5. Five respondents claimed failure of the appliance, while other 2 stated that the plant had been damaged physically as the main reason for the non-operation of biogas plant. Other two has also mentioned that lack of cattle as the main reason for the non-operation and ten have switched the fuel temporarily.

Table 5: Reasons for non-operational

Reasons	No of Respondents			
	Remote Hill	Hill	Terai	Total
Failure of appliance	0	3	2	5
Damaged physically	0	0	2	2
Lack of cattle	1	1	0	2
Fuel switching	0	6	4	10
Other	0	16	0	16
Total	1	26	8	35

Source: Biogas Users' Survey 2018

Survey was conducted only on those households whose plant is operational. Results presented hence forth are only for those households whose biogas plant is operational.

3.2 General Household Characteristics

Household demographics are presented in the table 6. The results show that average family size is 4.67 where 92 % households were headed by male and 8% household were headed by female. The

average age of the household head is 46.73 years, and it's lowest in Terai (at 45.57 years) than in remote hill (at 45.67 years) and hill (at 48.26 years).

Table 6: Family size and demographic information about Household Head

	Remote Hill	Hill	Terai	Total
Average family size	4.33	4.23	5.04	4.67
Sex of Household head %				
Male	33%	98%	91%	92%
Female	67%	2%	9%	8%
Average age of Household head	45.67	48.26	45.57	46.73

Source: Biogas Users' Survey 2018

Table 7 presents information on the ownership of facilities by households. All sampled households in the Terai, Hills and High Hills had electricity and toilets and other facilities whereas more than 95 % households have access to the amenities like radio/television, phone and tap water.

Table 7: Household Facilities

Facilities	Remote Hill (%)	Hill (%)	Terai (%)	Total (%)
Toilet	100%	100%	100%	100%
Tap water	67%	91%	100%	95%
Phone	100%	98%	100%	99%
Radio/Television	0%	100%	100%	97%
Grid Electricity	100%	100%	100%	100%

Source: Biogas Users' Survey 2018

3.3 Energy Use

Some 69% households used fuelwood in all three ecological belts for different purposes. Of which most of the households use fuelwood as alternate fuel for cooking. Use of fuelwood for cooking is highest in remote hill (100 percent) followed by Hills and terai. Overall, households also made minor use of fuel wood for water boiling (4 percent), animal feed preparation (55%), space heating (19%) and alcohol preparation (20%).

Table 8: Use and purpose of fuel-wood use

Purpose		Remote Hill	Hill	Terai	Total
Cooking	Number	3	36	32	71
	Percent	100%	84%	59%	71%
Animal Feed preparation	Number	0	26	29	55
	Percent	0%	60%	54%	55%
Space heating	Number	0	0	19	19
	Percent	0%	0%	35%	19%
Boiling water	Number	3	1	0	4
	Percent	100%	2%	0%	4%
Alcohol preparation	Number	3	2	15	20
	Percent	100%	5%	28%	20%
Total	Number	3	43	54	100

Source: Biogas Users' Survey 2018

Table 9 presents information on the source of fuelwood in the Terai, Hills and Remote Hills. It shows that the major source of fuelwood is community forest (86 percent) followed by government forest (9%) and private forest (5%).

Table 9: Source of fuelwood

Forest	Remote Hills	Hills	Terai	Total
	%	%	%	%
Government forest	100%	0%	11%	9%
Private forest	0%	9%	2%	5%
Community forest	0%	91%	87%	86%
Buy	0%	0%	0%	0%
Others	0%	0%	0%	0%

Source: Biogas Users' Survey 2018

Table 10 shows below responsibility of the firewood collection in majority lies within both adults of the family. It is observed that in 85% of cases, both the adult members of the family take the responsibility to collect the firewood. However, cases of this responsibility remaining with only female adult member of the family was observed in 13% of cases. In 2% of cases, the male have also the responsibility to collect the fuelwood.

Table 10: Responsibility of fuel wood collection

Family member type	Remote Hills		Hills		Terai		Total	
	Nos.	%	Nos.	%	Nos.	%	Nos.	%
Adult Male	0	0%	0	0%	2	4%	2	2%
Adult Female	3	100%	5	12%	4	8%	12	13%
Both	0	0%	37	88%	42	88%	79	85%
Children	0	0%	0	0%	0	0%	0	0%

Source: Biogas Users' Survey 2018

Prevailing price of different energy sources being used by the households was captured by the survey. However, respondents found it difficult to indicate the price of other fuels that normally doesn't prevail in the commodity market. In order to simplify this case, the consultant has presented the information related to the most common sources of fuels prevailing and in use by the households. Therefore, only the market price of the firewood and LPG are presented. The average price of firewood was reported to be NPR 428/bhari (1 bhari=35 Kg) while the maximum and minimum price for the same was at NPR 700 and NPR 200 respectively. For the LPG, the average price was reported at NPR 1470 per cylinder and the minimum and maximum prices being NPR 1500 and NPR 1400 per cylinder respectively.

Table 11: Price of different fuel used by household

Region		Fuelwood in NPR	LPG in NPR
Remote hill	Maximum	400	1500
	Mean	400	1500
	Minimum	400	1500
Hill	Maximum	300	1400
	Mean	483	1493
	Minimum	700	1500
Terai	Maximum	200	1400
	Mean	381	1449
	Minimum	700	1500
Total	Maximum	700	1500
	Mean	428	1470
	Minimum	200	1400

Source: Biogas Users' Survey 2018

3.4 Operation and Use of Biogas

The optimum use of biogas digesters was another parameter of interest during the survey. The households in remote hill ecological zone were found to be using the biogas for longer time i.e. 143 mins/day on an average. The users from terai reported that they use their biogas for 157 mins/day on an average followed by 134 mins/day in hill and 96 mins/day in remote hill.

The daily usage of the biogas digesters in hills and terai are somewhere above 2 hours per day which is normally the enough time to cater the need of households to prepare meal for a day. The normal operating hours of the biogas digesters as per the design is 2.0 to 3.0 hours a day. Comparing to this time, survey shows that the biogas digesters are performing reasonably well to cater the cooking needs of the households and in case of remote hills this service seems to be even better.

Table 12: Operation of biogas plant for different purposes

Ecological Belts	Average Time in minutes				Total
	Morning Tea	Lunch	Afternoon snacks	Evening meal	
Remote Hills	15	30	11	40	96
Hills	16	51	15	52	134
Terai	19	58	21	60	157
Total	17	53	17	56	143

Source: Biogas User's Survey, 2018

The operation of the biogas generated also depends on the feeding of the digester. A question was asked to the households to understand if the availability of dung has constrained digester feeding. In response to the question if all the available dung is fed or not, households reported that in 99% cases, they use all available dung.

Table 13: Feeding status of available dung

Ecological Belts	Yes	Percent	No	Percent
Remote Hills	3	100%	0	0%
Hills	42	98%	1	2%
Terai	54	100%	0	0%
Total	99	99%	1	1%

Source: Biogas User's Survey, 2016

The survey also attempted to understand the reason behind not feeding all the available dung. The household which do not use all the dung as feed reported that the reason for not feeding all the available dung is because they use the dung as farmyard manure.

Table 14: Reasons for not feeding available dung

Ecological Zone	Reason	Nos.	Percent
Remote Hill	Gas is already sufficient	0	0%
	Used as Farmyard Manure	0	0%
	Lack of time for feeding	0	0%
	Others	0	0%
Hill	Gas is already sufficient	0	0%
	Used as farmyard manure	1	100%
	Lack of time for feeding	0	0%
	Others	0	0%
Terai	Gas is already sufficient	0	0%

	Used as farmyard manure	0	0%
	Lack of time for feeding	0	0%
	Others	0	0%
Total	Gas is already sufficient	0	0%
	Used as farmyard manure	1	100%
	Lack of time for feeding	0	0%
	Others	0	0%

Source: Biogas User's Survey, 2018

3.5 Benefits of Biogas on Sustainable Development Indicators

Apart from the general household characteristics, energy use and use of biogas digesters, the survey attempted to collect information on the households' perception on the sustainable development indicators. For the purpose of this survey, questions pertaining to the indoor smoke, time saving, slurry use and toilet use along with biogas were asked with the respondents. This section of the report presents results on these attributes of the biogas digesters.

Biogas PoA and its CPAs were initiated to displace the use of non-renewable biomass as a source of cooking. Doing this, the project has availed the households with modern form of energy i.e. the households using solid biomass fuel are using biogas. This progression in the energy ladder is a definite contributor to the most of the sustainable development indicators stated above. Nevertheless, the survey relies on the perception of the households on whether any such difference has been perceived by the user or not.

The households were asked to state their perception towards the reduction in indoor smoke owing to the installation and use of biogas. Higher percentage (80%) of households perceived that the indoor smoke has reduced drastically while 20% reported that they've perceived reduction in the indoor smoke.

Table 15: Reduction in indoor air pollution

User's perception	Remote Hills		Hills		Terai		Total	
	Nos.	%	Nos.	%	Nos.	%	Nos.	%
Drastically reduced	3	100%	37	86%	40	74%	80	80%
Reduced	0	0%	6	14%	14	26%	20	20%
Not reduced	0	0%	0	0%	0	0%	0	0%
Do not know	0	0%	0	0%	0	0%	0	0%

Source: Biogas User's Survey, 2018

The households were asked to state their perception towards reduction of incidence of specific health related issue after the installation and use of biogas digesters. Of the total households more than 90% reported that they have observed reduction in the eye infection, respiratory diseases and fire related injuries whereas 87 % reported the reduction in cough problems due to indoor air pollution. Table 16 provides details of responses given by the households.

Table 16: User's perception of reduction in health problems

Ecological Belts	Health problems	Reduced		Not reduced		Do not know	
		Nos.	%	Nos.	%	Nos.	%
Remote Hill	Eye infection	3	100%	0	0%	0	0%
	Respiratory diseases	3	100%	3	100%	0	0%
	Cough	3	100%	0	0%	0	0%
	Fire related injury	3	100%	0	0%	3	100%

Ecological Belts	Health problems	Reduced		Not reduced		Do not know	
		Nos.	%	Nos.	%	Nos.	%
Hill	Eye infection	42	98%	0	0%	1	2%
	Respiratory diseases	41	95%	0	0%	2	5%
	Cough	35	81%	8	19%	0	0%
	Fire related injury	42	98%	0	0%	1	2%
Terai	Eye infection	54	100%	0	0%	2	4%
	Respiratory diseases	50	93%	0	0%	4	7%
	Cough	49	91%	5	9%	0	0%
	Fire related injury	51	94%	0	0%	3	6%
Total	Eye infection	99	99%	0	0%	3	3%
	Respiratory diseases	94	94%	3	3%	6	6%
	Cough	87	87%	13	13%	0	0%
	Fire related injury	96	96%	0	0%	7	7%

Source: Biogas User's Survey, 2018

The survey also attempted to record users' perception on the dark side of biogas usage. Accordingly, the users' were asked to state the incident of fire injury due to the use of biogas digester if they have encountered any. All of the total households surveyed from all ecological zones reported that they've not come across any fire related injury occurred due to the use of biogas digesters.

Table 17: Incident of fire due to biogas

Ecological Belts	Yes	Percent	No	Percent
Remote Hills	0	0%	3	100%
Hills	0	0%	43	100%
Terai	0	0%	54	100%
Total	0	0%	100	100%

Source: Biogas User's Survey, 2018

Similarly, the users were asked to state if the mosquito breeding has increased after the use of biogas. Basically, the slurry pits at the household make a fertile ground for mosquito breeding. Mixed responses were received from the users in this particular question. Majority of respondents (73%) reported that the mosquito breeding has increased after the installation and use of biogas digesters.

Table 18: Problem of mosquito breeding

Ecological Belts	Yes	Percent	No	Percent
Remote Hills	0	0%	3	100%
Hills	26	60%	17	40%
Terai	47	87%	7	13%
Total	73	73%	27	27%

Source: Biogas User's Survey, 2018

Since the biogas displaces firewood from kitchen, the drudgery towards collecting the firewood is normally reduced with the installation and use of biogas. The survey tried to capture the households' perception towards time saving after the use of biogas for the purpose of firewood collection. An attempt was made to capture information for all the age groups in the family; broadly the adult male and female members in the households and the children. The survey revealed that the users have perceived time saving in 100% of cases in female members of the households, 99% of cases in male members and 29% of cases in children.

Table 19: Time saving to collect fuel wood

Particulars		Remote hill		Hill		Terai		Total	
		Number	Percent	Number	Percent	Number	Percent	Number	Percent
Men	Yes	3	100%	43	100%	53	98%	99	99%
	No	0	0%	0	0%	0	0%	0	0%
Women	Yes	3	100%	43	100%	54	100%	100	100%
	No	0	0%	0	0%	0	0%	0	0%
Children	Yes	0	0%	14	33%	15	28%	29	29%
	No	0	0%	11	26%	20	37%	31	31%

Source: Biogas User's Survey, 2018

Similarly, 100% of respondents said that time required for women to cook food is reduced whereas 87 % of respondents said that time required for men to cook food is also reduced. Also 38 % stated that less time required for children to cook food after biogas installation.

Table 20: Time saving to cook food

Particulars		Remote hill		Hill		Terai		Total	
		Number	Percent	Number	Percent	Number	Percent	Number	Percent
Men	Yes	3	100%	38	88%	46	85%	87	87%
	No	0	0%	5	12%	7	13%	12	12%
Women	Yes	3	100%	43	100%	54	100%	100	100%
	No	0	0%	0	0%	0	0%	0	0%
Children	Yes	0	0%	16	37%	22	41%	38	38%
	No	0	0%	9	21%	14	26%	23	23%

Source: Biogas User's Survey, 2018

A follow-up question was asked with the households regarding the utilization of the saved time towards useful purpose. Most of the households in all ecological zones (82%) reported that they use the saved time in working in their farmland for agricultural activities.. Similarly, the households also reported that they clean their house periphery (75%) and involve in income generating activities (40%). The users also reported that they use the saved time in helping children for the study (73%), social activities (46%) and recreational activities (17%).

Table 21: Use of saved time

Particulars		Remote hill	Hill	Terai	Total
Working in the farmland	Number	3	30	49	82
	Percent	100%	70%	91%	82%
Helping Children with their studies	Number	3	42	28	73
	Percent	100%	98%	52%	73%
Cleaning house	Number	3	29	43	75
	Percent	100%	67%	80%	75%
Income generating Activities	Number	0	4	36	40
	Percent	0%	9%	67%	40%
Recreational Activities	Number	0	12	5	17
	Percent	0%	28%	9%	17%
Social Activities	Number	3	26	17	46
	Percent	100%	60%	31%	46%

Source: Biogas User's Survey, 2018

Bio-slurry is the only by-product of the biogas digester. Bio-slurry is rich in nitrogen content and can be utilized as farmyard manure in agricultural applications. Bio-slurry has the potential to displace the chemical fertilizers and is one of the key sustainable development contributors for the biogas technology. The survey attempted to capture the status of the application of bio-slurry in farmyard applications.

From the survey result it is observed that all of households use bio-slurry as manure. The percentage of households stating this response is homogenous across all ecological zones.

Table 22: Use of bio-slurry manure

Ecological Belts	Yes	Percent	No	Percent
Remote Hills	3	100%	0	0%
Hills	43	100%	0	0%
Terai	54	100%	0	0%
Total	100	100%	0	0%

Source: Biogas User's Survey, 2018

There are basically three forms of slurry application. The users are recommended to use the slurry either after composting or drying it but applying the fresh slurry is also common among the biogas user households. The survey attempted to seek users' response on the form of application of the bio-slurry as manure. The results reveal that in most of the cases the households have adopted to use slurry after composting (62%) followed by use the slurry as it is (9%). In 29% of cases the users' reported to use the slurry after drying it. Table 23 below depicts the result of the form of slurry use as reported by the households.

Table 23: Types of slurry application

Form of Slurry Use	Remote hill		Hill		Terai		Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Slurry as it is	0	0%	0	0%	9	17%	9	9%
After composting	3	100%	37	86%	22	41%	62	62%
Use after drying it	0	0%	6	14%	23	43%	29	29%

Source: Biogas User's Survey, 2018

Improvement on productivity after the use of the bio-slurry was another question asked to the households. Some 95% of the respondents reported an increased productivity after the application of bio-slurry as manure. Of the remaining households, 2 % households perceived no effect on the productivity while 1% told that they don't know about any effect on the productivity improvement after the application of bio-slurry as manure. 2% household also perceived that the productivity has decreased when applying bio-slurry to the crops. Table 24 provides detail on this particular question asked to the households.

Table 24: Impact of Slurry on Crop Productivity

Status	Remote Hills		Hills		Terai		Total	
	Nos.	%	Nos.	%	Nos.	%	Nos.	%
Increased	3	100%	42	98%	50	93%	95	95%
Decreased	0	0%	0	0%	2	4%	2	2%
No Effect	0	0%	0	0%	2	4%	2	2%
Don't Know	0	0%	1	2%	0	0%	1	1%

Source: Biogas User's Survey, 2018

Displacement of chemical fertilizers and the farmyard manure (in form of fresh dung) itself with the introduction of bio-slurry in the farmland was sought by the survey. Basically due to good content of nitrogen in the fertilizer the bio-slurry is a potent replacer of the Urea. However, the lesser use of chemical fertilizer is reported for fertilizers of other categories as well. It is observed from the result that, on an average the use of farm yard manure, urea, and DAP has reduced on the scenario after utilization of bio-slurry while, for obvious reason, the use of bio-slurry has increased. Table 25 and Table 26 below show the consumption of chemical fertilizers before and after biogas installed and their comparative changes in use.

Table 25: Use of manure and fertilizers

Average Manures / fertilizer used kg/year	Before Bio-slurry use				After Bio-slurry use			
	Remote Hills	Hills	Terai	Total	Remote Hills	Hills	Terai	Total
Farm Yard Manure	800	730	557.84	2087	100	69	199.02	368
Bio-slurry	200	77	0	277	600	523	350.00	1473
Urea	25	76	78	180	15	27	55.45	97
DAP	0	75	28	103	0	56	16.53	72
Potash	10	10	9	29	10	9	5	25

Source: Biogas User's Survey, 2018

Table 26: Comparative changes in use of chemical fertilizers

Manure/Fertilizer	Comparative change in use (%)			
	Remote Hills	Hills	Terai	Total
Farm Yard Manure	-88%	-90%	-64%	-82%
Bio-slurry	Absolute	Absolute	Absolute	Absolute
Urea	-40%	-65%	-29%	-46%
DAP	0%	-26%	-42%	-30%
Potash	0%	-9%	-41%	-16%

Construction and use of toilets reflects the status of sanitation in the households. In the biogas user households, the users are recommended to construct the toilets and connect it to their biogas if they don't have one and in case if they already have, they are recommended to connect the toilet to the biogas digester to improve the quantity of feeding materials in the digester. The survey reveals that the most of the households have toilets in their homes. It can therefore be said that the sanitation condition is good among the biogas user households. The entire surveyed users reported to have toilet at their households.

Table 27: Toilet construction

Ecological Belts	Yes	Percent	No	Percent
Remote Hills	3	100%	0	0%
Hills	43	100%	0	0%
Terai	54	100%	0	0%
Total	100	100%	0	0%

Source: Biogas User's Survey, 2018

Among the surveyed households, 20% toilets were constructed before biogas installation in their households whereas 80 % respondents reported that their toilets were constructed after biogas installation or simultaneously with biogas systems in their households.

Table 28: Timing for toilet construction

Ecological Belts	Before biogas	Percent	After biogas	Percent
Remote Hills	0	0%	3	100%
Hills	12	28%	31	72%
Terai	8	15%	46	85%
Total	20	20%	80	80%

Source: Biogas User's Survey, 2018

With the toilet connection to the biogas digesters, improving the health and hygiene in the biogas user households is likely to save other health related expenses. In total, in 79 % of households, the toilets were found to be connected to the digester. The proportion of toilet connection to the biogas digesters in remote hills, hill and terai was more than 70%. . There were 21% of cases where the toilets were not found to have been connected to the biogas digester.

Table 29: Toilet connection with biogas plant

Ecological Belts	Yes	Percent	No	Percent
Remote Hills	3	100%	0	0%
Hills	31	72%	12	28%
Terai	45	83%	9	17%
Total	79	79%	21	21%

Source: Biogas User's Survey, 2018

For the households who reported to have not connected their toilet to their biogas digester, a follow-up question was asked to seek reason for that. The possible reasons were provided to the users. The survey revealed that, majority of the households (81 % each) didn't connect their toilet to biogas as company did not suggest them for doing so. While 9.5% each didn't do so because of the additional cost required and socio-cultural reason. The detail of the responses from the respondents is presented in table below.

Table 30: Reasons for not connecting toilet to biogas plant

Reasons	Remote Hill		Hill		Terai		Total	
	Nos.	%	Nos.	%	Nos.	%	Nos.	%
Company did not suggest	0	0	12	100%	5	56%	17	81%
Due to additional cost	0	0	0	0%	2	22%	2	9.5%
Fear of bad smell	0	0	0	0%	0	0%	0	0%
Socio-cultural reasons	0	0	0	0%	2	22%	2	9.5%
Total	0	0%	12	57%	9	43%	21	100%

Source: Biogas User's Survey, 2018

CHAPTER-IV: CONCLUSION

The Biogas Users' Survey (BUS) was conducted as per the client's requirement to report the impact of the biogas digesters on the sustainable development indicators with the use of biogas digesters in the household. The survey covered total 135 households randomly selected in different eco-development regions as per the sampling design. The survey has come up with a result that around 73.72% digesters were functioning during the monitoring period while the rest were not functioning due to various reasons.

The result presented in the report summarizes the outcome of the complete survey conducted in these 100 households. The survey basically targeted to come up with the survey outcomes on the monitoring of sustainable development indicators associated with the smoke reduction, time saving, use of bio-slurry and the construction and use of toilets at the households. From the survey results the consultant is able to conclude that the users have perceived positive impacts from the biogas digesters implemented at their households. It is confirmed from the survey that there are perceived impacts on the reduction of indoor smoke, time saved to collect firewood, use of biogas slurry as manure and construction and use of toilet as supplementary feed to the biogas digesters.

ANNEXES

Annex 1: List of Households Selected for Survey

District	Plant Code	Owner Name	VDC/NP	Ward	Cluster	Size	Gpsn	Const Date (AD)	Company	Activity	Eco_zone
Bardiya	PDGBAR670045	HARI KRISHINA THARU	Neulapur	3	KARMALA	6	PDG00999	14-Mar-11	PDG	CPA4	TE
Bardiya	PDGBAR670057	KARNA BDR. THARU	Neulapur	2	PREHANI	6	PDG00996	16-Mar-11	PDG	CPA4	TE
Bardiya	PDGBAR670046	MANTURANI THARUNI	Neulapur	3	KARMALA	6	PDG01054	16-Mar-11	PDG	CPA4	TE
Bardiya	PDGBAR670050	MANJU THARUNI	Neulapur	2	PREHANI	6	PDG00997	17-Mar-11	PDG	CPA4	TE
Bardiya	PDGBAR670051	BURDHANI THARU	Neulapur	2	PREHANI	6	PDG00998	18-Mar-11	PDG	CPA4	TE
Bardiya	PDGBAR670047	CHANDRA LALA THARU	Neulapur	3	KARMALA	6	PDG00975	18-Mar-11	PDG	CPA4	TE
Bardiya	PDGBAR670048	BECHAN THARU	Neulapur	3	KARMALA	6	PDG01055	20-Mar-11	PDG	CPA4	TE
Bardiya	PDGBAR670044	SURAJ LALA THARU	Neulapur	3	KARMALA	4	PDG00974	20-Mar-11	PDG	CPA4	TE
Bardiya	PDGBAR680092	BEDANIYA THARU	Neulapur	3	KARMAHA	6	PDG01053	22-Mar-11	PDG	CPA4	TE
Bardiya	NKGBAN670019	GOPI LAL THARU	Neulapur	2	PRATAPUR	6	NKG01969	11-Apr-11	NKG	CPA4	TE
Bardiya	PDGBAR670151	NEHASIYA THARU	Neulapur	3	KARMALA	4	PDG01034	15-Apr-11	PDG	CPA4	TE
Bardiya	NKGBAN670018	PADAM BDR THARU	Neulapur	2	PRARAHANI	6	NKG01967	18-Apr-11	NKG	CPA4	TE
Bardiya	NKGBAN670025	UDAYA RAJ THARU	Neulapur	2	PRATAPUR	4	NKG01961	23-Apr-11	NKG	CPA4	TE
Bardiya	NKGBAN670026	RUP LAL THARU	Neulapur	2	PRATAPUR	6	NKG01525	23-Apr-11	NKG	CPA4	TE
Bardiya	NKGBAN670027	RAM LAL THARU	Neulapur	2	PRATAPUR	4	NKG01523	23-Apr-11	NKG	CPA4	TE
Bardiya	NKGBAN680001	CHUDAMANI CHAUDHARI	Neulapur	2	PRATABPUR	4	NKG02290	3-Jun-11	NKG	CPA4	TE
Bardiya	TGGBAR670040	NABAL SING THAPA	Neulapur	2	PRATABPUR	6	TGG01147	15-Jun-11	TGG	CPA4	TE
Chitwan	HEDCHI670018	LAL KRISHNA DARAI	Kumroj	9	GHOHRELA	6	HED01006	24-Feb-11	HED	CPA4	TE
Chitwan	HEDCHI670006	ARJUN BISHWOKARMA	Kumroj	9	GHOKRELA	6	HED01005	27-Feb-11	HED	CPA4	TE
Chitwan	HEDCHI670011	MAHALAXMI DHUNGANA	Kumroj	9	GHOHRELA	6	HED01002	4-Mar-11	HED	CPA4	TE
Chitwan	HEDCHI670008	LAXUMAN SHRESTHA	Kumroj	9	GHOKREL	6	HED01011	4-Mar-11	HED	CPA4	TE
Chitwan	HEDCHI670010	SURESH DARAI	Kumroj	9	GHOHRELA	6	HED01003	4-Mar-11	HED	CPA4	TE
Chitwan	HEDCHI670013	RAMESH KUMAR MAHATO	Kumroj	9	GHOKRELA	6	HED01018	5-Mar-11	HED	CPA4	TE
Chitwan	HEDCHI670015	RAMESH KUMAR MAHATO	Kumroj	9	GHOHRELA	6	HED01046	5-Mar-11	HED	CPA4	TE
Chitwan	HEDCHI670023	SOM BDR. DARAI	Kumroj	9	GHOHRELA	6	HED01016	7-Mar-11	HED	CPA4	TE
Chitwan	HEDCHI670025	RAMUWA MAHATO	Kumroj	9	GHOHRELA	6	HED01042	10-Mar-11	HED	CPA4	TE
Chitwan	HEDCHI670027	GOMA KHATRI	Kumroj	9	GHOHRELA	6	HED01048	11-Mar-11	HED	CPA4	TE
Chitwan	HEDCHI670034	PRATIMA DARAI	Kumroj	9	GHOHRELA	6	HED01013	11-Mar-11	HED	CPA4	TE
Chitwan	HEDCHI670044	AAITA RAM DARAI	Kumroj	9	GHOHRELA	6	HED01044	13-Mar-11	HED	CPA4	TE
Doti	RAPDOT680005	DIRGHA RAJ BHATTA	Dipayal Np	5	PUNNA	4	NKG02542	8-Jun-11	RAP	CPA4	HI
Doti	RAPDOT680018	DAMBAR BDR BISTA	Dipayal Np	5	PUNNA	6	NKG02555	13-Jun-11	RAP	CPA4	HI
Doti	RAPDOT680014	PURNA SINGH BISTA	Dipayal Np	5	PUNNA	4	NKG02551	24-Nov-11	RAP	CPA4	HI
Doti	RAPDOT680008	DIPENDRA RAJ BHATTA	Dipayal Np	5	PUNNA	4	NKG02545	20-Dec-11	RAP	CPA4	HI
Kanchanpur	TGGKIL670141	MAN B. CHAND	Rampur Bilaspur	1	BHUDAGAUDI	6	TGG01815	17-Apr-11	TGG	CPA4	TE
Kanchanpur	TGGKIL670117	DEV BDR BI.KA	Rampur Bilaspur	1	BHUNDA TAPAR	8	TGG01823	18-Apr-11	TGG	CPA4	TE
Kanchanpur	TGGKIL670148	DHAN B. SHAHI	Rampur Bilaspur	1	BHUDA	6	TGG01812	31-May-11	TGG	CPA4	TE
Kanchanpur	TGGKIL670149	GAGAN B. BUDHA	Rampur Bilaspur	1	BHUDA TAPAR	6	TGG01820	8-Jun-11	TGG	CPA4	TE

Kanchanpur	TGGKIL670150	SHER B. KAMI	Rampur Bilaspur	1	BHUDAGAUDI	6	TGG01811	11-Jun-11	TGG	CPA4	TE
Kanchanpur	SPGKAN670077	CHHABI NARAYAN DAGAURA	Rampur Bilaspur	1	BHUDAGAURI	6	SPG01012	12-Jun-11	SPG	CPA4	TE
Kanchanpur	SPGKAN670076	CHHUNUK LAL CHAUDHARI	Rampur Bilaspur	1	MUDAGAUDI	8	SPG01015	13-Jun-11	SPG	CPA4	TE
Kanchanpur	TGGKIL670151	HARKA B. BISHWOKARMA	Rampur Bilaspur	1	BHUDATAPAR	6	TGG01818	14-Jun-11	TGG	CPA4	TE
Kanchanpur	TGGKIL680037	LOK BDR SUNAR	Rampur Bilaspur	1	BHUDAGAUDI	6	TGG01830	13-Nov-11	TGG	CPA4	TE
Kanchanpur	TGGKIL680040	SHER BDR SUNAR	Rampur Bilaspur	1	BHUDAGAUDI	6	TGG01829	6-Dec-11	TGG	CPA4	TE
Kanchanpur	SPGKAN680015	JUGAMATI CHAUDHARI	Rampur Bilaspur	1	BHUDAGAUDI	6	SPG01658	22-Dec-11	SPG	CPA4	TE
Kanchanpur	SMGKAN680053	KALAWATI THAPA	Rampur Bilaspur	1	BHUDA	6	SMG00770	6-Jan-12	SMG	CPA4	TE
Kanchanpur	SMGKAN680054	DROPATI THAGUNNA	Rampur Bilaspur	1	BHUDA	6	SMG00536	6-Jan-12	SMG	CPA4	TE
Kanchanpur	TGGKIL680044	LAL BDR SHAHI	Rampur Bilaspur	1	BHUDA	6	TGG02069	9-Jan-12	TGG	CPA4	TE
Kanchanpur	SPGKAN680016	MAUNA DAGAURA	Rampur Bilaspur	1	BHUDAGAUDI	6	SPG01593	15-Jan-12	SPG	CPA4	TE
Kanchanpur	GPCKAN680059	RAM LAL CHAUDHARI	Rampur Bilaspur	1	BHUDA	6	GPC04447	20-Feb-12	GPC	CPA4	TE
Nawalparasi	RGGNAW670023	DIL BDR. BARHAGHARE THAPA MAGAR	Benimanipur	3	KOLEDADA	6	RGG12197	15-Mar-11	RGG	CPA4	TE
Nawalparasi	JGGCHI670058	HIRA SINGH DARLAMI	Benimanipur	3	PAKHAPANI	6	JGG01106	23-Mar-11	JGG	CPA4	TE
Nawalparasi	JGGCHI670057	KAMALA MASRANGI	Benimanipur	3	PAKHAPANI	6	JGG01274	23-Mar-11	JGG	CPA4	TE
Nawalparasi	JGGCHI670119	RUPA KUMARI KUNWAR	Benimanipur	3	NAYA GAUN	6	JGG01278	18-May-11	JGG	CPA4	TE
Nawalparasi	JGGCHI670117	DHAL BDR RANA	Benimanipur	3	NAYA GAUN	6	JGG01279	9-Jun-11	JGG	CPA4	TE
Nawalparasi	JGGCHI670126	SUNITA KUMAL	Benimanipur	3	NAYA GAUN	6	JGG01281	15-Jun-11	JGG	CPA4	TE
Nawalparasi	JGGCHI670120	PADAM BDR KUMAL	Benimanipur	3	SALGHARI TOLE	6	JGG01283	19-Jun-11	JGG	CPA4	TE
Nuwakot	EGCRAS680001	NAVRAJ DAHAL	Duipipal	7	KHABYACHAUR	6	EGC02002	8-Sep-11	EGC	CPA4	HI
Nuwakot	EGCRAS680007	KANCHHI MAYA TAMANG	Duipipal	7	HALEDANDA	6	EGC00782	8-Sep-11	EGC	CPA4	HI
Nuwakot	EGCRAS680013	SANTOSH TAMANG	Duipipal	7	GANYA TOLE	4	EGC01472	8-Sep-11	EGC	CPA4	HI
Nuwakot	EGCRAS680015	JANAK BHATTARAI	Duipipal	7	DUIPIPLE	6	EGC00772	8-Sep-11	EGC	CPA4	HI
Nuwakot	MANDHD670104	PAMPHA MAGAR	Duipipal	7	ARCHALE	2	MAN00581	18-Mar-11	MAN	CPA4	HI
Nuwakot	MANDHD670105	GORI MAYA TAMANG	Duipipal	7	ARCHALE	2	MAN00582	18-Mar-11	MAN	CPA4	HI
Nuwakot	MANDHD670106	DIL BDR LAMA	Duipipal	7	ARCHALE	2	MAN00546	17-Mar-11	MAN	CPA4	HI
Nuwakot	MANDHD670107	THULI MAYA TAMANG	Duipipal	7	ARCHALE	2	MAN00548	17-Mar-11	MAN	CPA4	HI
Nuwakot	MANDHD670114	CHHABI LAL TAMANG	Duipipal	7	DADHUWA	2	MAN00488	18-Mar-11	MAN	CPA4	HI
Nuwakot	MANDHD670115	SUBBA TAMANG	Duipipal	7	DADHUWA	4	MAN00487A	19-Mar-11	MAN	CPA4	HI
Nuwakot	MANDHD670117	KANCHHI MAYA TAMANG	Duipipal	7	DADHUWA	2	MAN00579	19-Mar-11	MAN	CPA4	HI
Nuwakot	MANDHD670121	SUNIL TAMANG	Duipipal	7	DADUWA	2	MAN00497	19-Mar-11	MAN	CPA4	HI

Nuwakot	MANDHD670122	RAM BDR TAMANG	Duipipal	7	DADUWA	2	MAN00489	19-Mar-11	MAN	CPA4	HI
Nuwakot	MANDHD670123	NIRMALA TAMANG	Duipipal	7	DADUWA	2	MAN00649	20-Mar-11	MAN	CPA4	HI
Nuwakot	MANDHD670124	KRISHNA BDR TAMANG	Duipipal	7	DADUWA	2	MAN00499	19-Mar-11	MAN	CPA4	HI
Nuwakot	MANDHD670127	DHAN BDR TAMANG	Duipipal	7	ARCHALE	2	MAN00535	19-Mar-11	MAN	CPA4	HI
Nuwakot	MANDHD670128	THULI MAIYA TAMANG	Duipipal	7	BADARI	2	MAN00648	20-Mar-11	MAN	CPA4	HI
Nuwakot	MANDHD670129	BIR BDR TAMANG	Duipipal	7	BADARE	2	MAN00498	20-Mar-11	MAN	CPA4	HI
Nuwakot	MANDHD670132	RITA TAMANG	Duipipal	7	DEURALI	2	MAN00524	20-Mar-11	MAN	CPA4	HI
Nuwakot	MANDHD670135	BUDDHI MAN TAMANG	Duipipal	7	DADUWA	2	MAN00641	28-Mar-11	MAN	CPA4	HI
Nuwakot	MANDHD670136	SHER BDR TAMANG	Duipipal	7	DADUWA	2	MAN00594	28-Mar-11	MAN	CPA4	HI
Nuwakot	MANDHD670137	DIPESH TAMANG	Duipipal	7	DHARE	2	MAN00593	29-Mar-11	MAN	CPA4	HI
Nuwakot	MANDHD670173	GYANU MAYA TAMANG	Duipipal	7	BALUWADANDA	2	MAN00549	19-Apr-11	MAN	CPA4	HI
Nuwakot	MANDHD670174	PRATAP LAMA	Duipipal	7	ARCHALE	2	MAN00539	19-Apr-11	MAN	CPA4	HI
Nuwakot	MANDHD670175	NAL BDR TAMANG	Duipipal	7	ARCHALE	2	MAN00547	19-Apr-11	MAN	CPA4	HI
Nuwakot	MANDHD670176	GAJ BDR TAMANG	Duipipal	7	ARCHALE	2	MAN00538	19-Apr-11	MAN	CPA4	HI
Nuwakot	MANDHD670177	GYANU MAYA MUKTAN	Duipipal	7	ARCHALE	2	MAN00521	19-Apr-11	MAN	CPA4	HI
Nuwakot	MANDHD670179	HIT BDR MAGAR	Duipipal	7	ARCHALE	2	MAN00584	20-Apr-11	MAN	CPA4	HI
Nuwakot	MANDHD670180	JAL MAYA TAMANG	Duipipal	7	ARCHALE	2	MAN00522	20-Apr-11	MAN	CPA4	HI
Nuwakot	MANDHD670181	NISA TAMANG	Duipipal	7	ARCHALE	2	MAN00523	20-Apr-11	MAN	CPA4	HI
Solukhumbu	BBISOL680009	EN BDR. MAGAR	Tingla	8	BELDANDA	6	BBI06445	24-Jun-11	BBI	CPA4	RH
Solukhumbu	BBISOL680012	THAKI MAYA MAGAR	Tingla	8	BELDANDA	6	BBI06380	28-Jun-11	BBI	CPA4	RH
Solukhumbu	BBISOL680011	MAN KUMARI GHARTI MAGAR	Tingla	8	SURKE	6	BBI06443	28-Jun-11	BBI	CPA4	RH
Solukhumbu	BBISOL680010	BHIM KUMARI KARKI	Tingla	8	SURKE	6	BBI08441	28-Jun-11	BBI	CPA4	RH
Sunsari	MECSUN670105	DIL BDR DAHAL	Bharaul	4	KECHWAI	6	MEC02294	24-Feb-11	MEC	CPA4	TE
Sunsari	MECSUN670092	LAXMI KARKI	Bharaul	1	BHOJPURE	6	MEC02479	27-Feb-11	MEC	CPA4	TE
Sunsari	MECSUN670087	LAL BDR PURI	Bharaul	3	MILAN	6	MEC03356	27-Feb-11	MEC	CPA4	TE
Sunsari	MECSUN670094	NIR BDR POUDEL	Bharaul	3	NAYA BASTI	6	MEC03357	1-Mar-11	MEC	CPA4	TE
Sunsari	BGUMOR670026	TANKA MAYA BISHWOKARMA	Bharaul	3	IKAI	6	BGU00020	17-Mar-11	BGU	CPA4	TE
Sunsari	MECSUN670089	RADHA KUMARI ADHIKARI	Bharaul	1	RAJ MARG	6	MEC03363	1-Apr-11	MEC	CPA4	TE
Sunsari	MECSUN670101	BUDDHI KARKI	Bharaul	6	ANDRA MAHTE	6	MEC02295	7-Apr-11	MEC	CPA4	TE
Sunsari	MECSUN670102	YASODA KATUWAL	Bharaul	3	NARAYBASTI	6	MEC03365	18-Apr-11	MEC	CPA4	TE
Sunsari	MECSUN670095	LILA MAYA RAUT	Bharaul	3	RAJMARGA	6	MEC02478	18-Apr-11	MEC	CPA4	TE
Sunsari	MECSUN670104	RAM JI KARKI	Bharaul	6	JAMJOKI	6	MEC03360	19-May-11	MEC	CPA4	TE
Surkhet	NCBSUR670038	SIDDDHIKHAR REGMI	Latikoili	3	GHURSA	4	NCB00177	19-Apr-11	NCB	CPA4	HI
Surkhet	NCBSUR670008	AMRITA B.C	Latikoili	3	GHUSRA	6	NCB00159	10-May-11	NCB	CPA4	HI
Surkhet	PDGBAR670149	GOMA KUMARI CHAUDHARI	Latikoili	3	DHRUSA	4	PDG01119	13-Jun-11	PDG	CPA4	HI
Surkhet	PDGBAR680057	CHAKRA BDR BUDHA	Latikoili	3	MANIKAPUR	4	PDG01125	24-Feb-12	PDG	CPA4	HI
Tanahu	PGGTAH670075	KHALE THAPA	KahuShivapur	1	JIKHABARI	4	PGG04771	11-Jun-11	PGG	CPA4	HI
Tanahu	PGGTAH670076	DHAN MAYA THAPA	KahuShivapur	1	CHHAP	4	PGG04703	15-Jun-11	PGG	CPA4	HI
Tanahu	PGGTAH670431	REKH BDR THAPA	KahuShivapur	1	DANDAKHUDI	4	PGG04772	3-May-11	PGG	CPA4	HI
Tanahu	PGGTAH670432	KRISHNA BDR THAPA	KahuShivapur	1	DANDAKHUDI	4	PGG04774	3-May-11	PGG	CPA4	HI
Tanahu	PGGTAH670433	CHHAL BDR THAPA	KahuShivapur	1	DANDAKHUDI	4	PGG04914	3-May-11	PGG	CPA4	HI

Tanahu	PGGTAH670435	NAR MAYA ALE MAGAR	KahuShivapur	1	DANDACHHAP	4	PGG04775	3-May-11	PGG	CPA4	HI
Tanahu	PGGTAH670436	KHEM BDR RANA MAGAR	KahuShivapur	1	DANDAKHUDI	4	PGG04794	18-May-11	PGG	CPA4	HI
Tanahu	PGGTAH670437	PRADIP THAPA MAGAR	KahuShivapur	1	DANDAKHUDI	4	PGG04704	17-May-11	PGG	CPA4	HI
Tanahu	PGGTAH670438	DHANI MAYA THAPA	KahuShivapur	1	DANDAKHUDI	4	PGG04697	18-May-11	PGG	CPA4	HI
Tanahu	PGGTAH670439	DEVI MAYA ALE	KahuShivapur	1	DANDAKHUDI	4	PGG04770	17-May-11	PGG	CPA4	HI
Tanahu	PGGTAH670441	SUN MAYA KAMI	KahuShivapur	1	DANDAKHURI	4	PGG04793	3-May-11	PGG	CPA4	HI
Tanahu	PGGTAH670442	DURGA BDR THAPA	KahuShivapur	1	DANDAKHUDI	4	PGG04698	3-May-11	PGG	CPA4	HI
Tanahu	PGGTAH670546	RIMA THAPA	KahuShivapur	1	CHHAPA	4	PGG04699	8-Jun-11	PGG	CPA4	HI
Tanahu	PGGTAH670594	TILI MAYA THAPA MAGAR	KahuShivapur	1	JARUWAHAR	4	PGG03151	29-May-11	PGG	CPA4	HI
Tanahu	PGGTAH670647	KHIM BDR RANA MAGAR	KahuShivapur	1	JHAPUTAR	4	PGG04858	2-May-11	PGG	CPA4	HI
Tanahu	PGGTAH670661	BANI MAYA THAPA	KahuShivapur	1	CHHAPA	4	PGG04912	10-Jun-11	PGG	CPA4	HI
Tanahu	PGGTAH670662	NAR BDR. RABA MAGAR	KahuShivapur	1	LOKMA	4	PGG04795	29-May-11	PGG	CPA4	HI
Tanahu	PGGTAH670663	PADAM BDR THAPA	KahuShivapur	1	BBIRKHABARI	4	PGG04773	26-May-11	PGG	CPA4	HI
Tanahu	PGGTAH670665	HARI MAYA THAPA	KahuShivapur	1	CHHAP	4	PGG04705	3-Jun-11	PGG	CPA4	HI
Tanahu	PGGTAH670666	MADHU MAYA THAPA	KahuShivapur	1	JIKHABARI	4	PGG04768	23-May-11	PGG	CPA4	HI
Tanahu	PGGTAH670668	TIL BDR THAPA	KahuShivapur	1	JIKHABARI	4	PGG04708	15-May-11	PGG	CPA4	HI
Tanahu	PGGTAH670669	PARBATI THAPA	KahuShivapur	1	LOKMA	4	PGG04791	3-Jun-11	PGG	CPA4	HI
Tanahu	PGGTAH670700	GANGI SARA THAPA	KahuShivapur	1	LOKBHA	4	PGG04707	3-Jun-11	PGG	CPA4	HI
Tanahu	PGGTAH670701	MAN SARA THAPA	KahuShivapur	1	LOMBHA	4	PGG04709	3-Jun-11	PGG	CPA4	HI
Tanahu	PGGTAH670702	HIRA SARU MAGAR	KahuShivapur	1	CHHAPA	4	PGG04701	3-Jun-11	PGG	CPA4	HI
Udayapur	NGUSIR670016	GYANENDRA KUMAR KATUWAL	Katari	8	SISGHATI	6	NGU00218	21-Apr-11	NGU	CPA4	HI
Udayapur	NGUSIR670018	RESHAM BDR MAGAR	Katari	8	SARANG PATI	6	NGU00220	18-Apr-11	NGU	CPA4	HI
Udayapur	NGUSIR670020	MOHAN BDR BHUJEL	Katari	8	SISAGHATI	8	NGU00216	18-Apr-11	NGU	CPA4	HI
Udayapur	NGUSIR670022	MIN BDR KHADKA	Katari	8	SISAGHATI	6	NGU00123	8-May-11	NGU	CPA4	HI
Udayapur	UNOSUN680005	HEM KUMARI KHATRI	Katari	8	LALPUR	4	UNO00940	13-Aug-11	UNO	CPA4	HI
Udayapur	UNOSUN680007	LILA KARKI	Katari	8	LALPUR	4	UNO00937	14-Aug-11	UNO	CPA4	HI

Annex 2: Survey Questionnaire

General Information

Activity	_____
Name and code of district	_____
Name and code of VDC	_____
Ward Number	_____
Name of the plant owner	_____
Gender of the biogas owner (Male =1, Female =2)	_____
Full Name of the respondent	_____
Contact Telephone	_____
Size of the biogas plant	_____ m ³
Biogas digester installation date (verify with user booklet) in AD (DD/MM/YY)	____/____/____
Plant owner's booklet number (verify with user booklet)	_____
Dome gas pipe number (observe the DGP number and take photograph)	_____

1. Operational Status of Biogas Plant

QN	Question	Coding Categories	Skip										
1.1	How long have you been using biogas plant? (Verify with users' booklet if available)	____ _ (Number of years in operation)											
1.2	Is your biogas plant still in operation?	<table border="1"> <tr> <th>Yes</th> <th>No</th> </tr> <tr> <td>1</td> <td>2</td> </tr> </table>	Yes	No	1	2	If Yes, go to 1.11						
Yes	No												
1	2												
1.3	If No, since when have you not used your biogas plant?	____ _ (Write in months)											
1.4	Why did you stop using biogas?	<table border="1"> <tr> <td>Malfunction of appliance</td> <td>1</td> </tr> <tr> <td>Damaged physically</td> <td>2</td> </tr> <tr> <td>Lack of cattle</td> <td>3</td> </tr> <tr> <td>Switched to another fuel</td> <td>4</td> </tr> <tr> <td>Others (specify):</td> <td>5</td> </tr> </table>	Malfunction of appliance	1	Damaged physically	2	Lack of cattle	3	Switched to another fuel	4	Others (specify):	5	<div style="display: flex; align-items: center;"> <div style="margin-right: 10px;"> </div> <div> 1.5 End survey 1.11 & end survey End survey </div> </div>
Malfunction of appliance	1												
Damaged physically	2												
Lack of cattle	3												
Switched to another fuel	4												
Others (specify):	5												
1.5	Are there chances that your biogas will get back to operation by simple repair?	<table border="1"> <tr> <th>Yes</th> <th>No</th> </tr> <tr> <td>1</td> <td>2</td> </tr> </table>	Yes	No	1	2							
Yes	No												
1	2												
1.6	Have you made an attempt to repair your biogas plant through technician?	<table border="1"> <tr> <th>Yes</th> <th>No</th> </tr> <tr> <td>1</td> <td>2</td> </tr> </table>	Yes	No	1	2							
Yes	No												
1	2												
1.7	Was the damage caused by earthquake of April 2015 (Baisakh, 2072)?	<table border="1"> <tr> <th>Yes</th> <th>No</th> </tr> <tr> <td>1</td> <td>2</td> </tr> </table>	Yes	No	1	2							
Yes	No												
1	2												
1.8	If yes, why did not you repair it until now?	<table border="1"> <tr> <td>Living at same place not possible</td> <td>1</td> </tr> <tr> <td>Other priority prevail over biogas</td> <td>2</td> </tr> <tr> <td>No support to repair biogas</td> <td>3</td> </tr> <tr> <td>We don't intend to use it anymore</td> <td>4</td> </tr> </table>	Living at same place not possible	1	Other priority prevail over biogas	2	No support to repair biogas	3	We don't intend to use it anymore	4			
Living at same place not possible	1												
Other priority prevail over biogas	2												
No support to repair biogas	3												
We don't intend to use it anymore	4												
1.9	Do you have plans to get cattle back or source dung from neighborhood?	<table border="1"> <tr> <th>Yes</th> <th>No</th> </tr> <tr> <td>1</td> <td>2</td> </tr> </table>	Yes	No	1	2							
Yes	No												
1	2												
1.10	After how many days or months your biogas will be back in operation?	<table border="1"> <tr> <th>Days</th> <th>Months</th> </tr> <tr> <td>____ _</td> <td>____ _</td> </tr> </table>	Days	Months	____ _	____ _							
Days	Months												
____ _	____ _												
1.11	How many cattle do you have? (Those providing feeding materials to	<table border="1"> <tr> <th>Livestock</th> <th>Total</th> <th>Adult</th> <th>Baby</th> </tr> <tr> <td>Cow/Oxen</td> <td></td> <td></td> <td></td> </tr> </table>	Livestock	Total	Adult	Baby	Cow/Oxen						
Livestock	Total	Adult	Baby										
Cow/Oxen													

QN	Question	Coding Categories	Skip
	<i>the biogas plants)</i>	Buffalo Others (specify)	
1.12	How is the physical condition of biogas plant? (Observe and record)	Excellent Good Poor	1 2 3
	1. Excellent: All appliances are in order for eg, stove is burning, mixture and slurry pit is not physically damaged, fresh slurry is seen at the outlet, top surface of dome is not exposed. 2. Good: Some appliances might not be in order eg, minor physical damages are observed in mixture and slurry pit, dome surface is exposed to environment but the stove is still burning. 3. Poor: Appliances are not in order, mixture and slurry pits are physically damaged, slurry has hardened at the outlet or the slurry outlet is dry, user affirms that the plant operates with toilet waste and the stove flame is low and doesn't meet all the basic household requirement.		

2. Household Characteristics

QN	Question	Coding Categories	Skip
2.1	How many people live in your house? (indicate total number of person consuming food in the family kitchen)	---- (Number of person)	
2.3	Household head	Male Female Age (years)	1 2
2.4	Do you have following facilities in your household?	Facilities Toilet Drinking water/Tap Telephone/Mobile Electricity (Grid) Radio/Television	Yes No 1 2 1 2 1 2 1 2

3. Energy source used for cooking

QN	Question	Coding Categories	Skip
3.1	What alternate fuel do you use for cooking apart from Biogas? (Multiple response possible)	Firewood Crop Residues Dung Charcoal Kerosene LPG Saw Dust Others (specify)	1 2 3 4 5 6 7 8 → 3.2 (If 2-8, go to 3.6)
3.2	If fuel wood is still in use after biogas installation, for what purpose it is used? (Multiple response possible)	Cooking Animal feed preparation Alcohol preparation Space heating Boiling water Others (specify)	1 2 3 4 5 6
3.3	Where do you usually collect fuelwood from?	Government Forest Private Forest Community Forest Buy Others (specify)	1 2 3 4 5
3.4	Who mostly collects the firewood in your family?	Adult Male Adult Female Both Children	1 2 3 4
3.5	Do you purchase fuelwood?	Yes No	1 2
3.6	Could you provide the price of following energy	Source Unit	Price

QN	Question	Coding Categories		Skip (NPR)
	source that is usually used for cooking?		(1= Bhari, 2= K.G., 3= Litre, 4= Number)	
		Fuelwood		
		Crop Residue		
		Dung		
		Charcoal		
		Kerosene		
		LPG		
		Saw Dust		
		Other (specify)		

4. Recalling trends in fuel wood availability and collection

[Note to the enumerators: In following questions you have to ask respondents about the status of forest coverage, time to collect fuelwood from the forest in different time periods. While you ask these questions you have to be sure about two points.

1. Tell them clearly that forest you mean is trees with hard woods not bush.

2. Always refer to the same piece of forest in two time periods. For example, respondent might have access to a new forest as a result of community forest initiative but s/he might have has access to different forest in the past. This might affect his response. So, make sure respondent is referring to the same piece of forest in different time periods.]

QN	Question	Coding Categories		Skip
4.1	How has the time required to reach forest has changed over past years in your surrounding?	Increased	1	4.3
		Same as previous	2	
		Decreased	3	
4.2	What could be the possible reasons for decrease in travel time?	Started accessing new forest patch which is more near	1	
		Traveling to forest has been more convenient due to transportation service	2	
		Forest area has expanded due to conservation efforts	3	
4.3	What changes do you have observed? (please circle as appropriate) Compare between B.S. 2046 and B.S. 2058 i.e. 1990 and 2000	Increased	1	4.5
		Same as previous	2	
		Decreased	3	
4.4	What could be the possible reasons for decrease in travel time?	Started accessing new forest patch which is more near	1	
		Traveling to forest has been more convenient due to transportation service	2	
		Forest area has expanded due to conservation efforts	3	
4.5	What changes do you have observed? (please circle as appropriate) Compare between B.S. 2058 and B.S. 2074 i.e. 2000 and 2018	Increased	1	4.7
		Same as previous	2	
		Decreased	3	
4.6	What could be the possible reasons for decrease in travel time?	Started accessing new forest patch which is more near	1	
		Traveling to forest has been more convenient due to transportation service	2	
		Forest area has expanded due to conservation efforts	3	

QN	Question	Coding Categories			Skip
4.7	How long did/does it take to travel to forest collect and come back from forest to gather 1-Bhari of firewood for you in different time periods?	Write in Minutes			
		Period	To reach forest	To collect 1 Bhari of fuelwood	To come back
		1990 (2046)			
		2000 (2058)			
4.8	What was/is the average cost of 1-Bhari of fuelwood (If respondents says fuelwood is not purchased ask him/her to estimate the price)	Period		Price in NPR	
		1990 (2046)			
		2000 (2058)			
		2018 (2074)			
4.9	Has shortage of firewood led to use of twigs, crop and agro residue or other low grade biomass fuel?	Yes		No	
		1		2	
4.10	What biomass resource is dominant in the mixture of your domestic biomass fuel in different time periods? (For ranking of the fuel type please rank 1 for the fuel type that the respondent reports as most highly used fuel and so on.)	Fuel Type		Ranking	
				1990 (2046)	2000 (2058)
				2018 (2074)	
		Hard wood fuel			
		Twigs			
		Agriculture residue			
		Dung cake			
		Saw dust			
		Charcoal			
		Others (specify)			

5. Biogas Plant Operation and Maintenance

Biogas Plant Operation and Maintenance				
QN	Question	Coding Categories		Skip
5.1	Do you use biogas for the following purposes and could you estimate the time you use it for each purposes?	Purpose	Time (In Minutes)	
		Morning Breakfast		
		Lunch		
		Afternoon snacks		
		Evening meal		
5.2	Do you feed all of available dung in biogas plant?	Yes	No	
		1	2	
5.3	If all available dung is not fed, the reason behind this?	Gas is already sufficient	1	
		Used as farmyard manure	2	
		Lack of time for feeding	3	
		Others (specify)	4	
5.4	How would you rate the routine visit of installer company during 3 years guarantee period?	Good	1	
		Satisfactory	2	
		Poor	3	
		1. Good: Immediate service 2. Satisfactory: Delayed service 3. Poor: No service at all or service provided after several follow ups.		
5.5	Have you ever repaired your biogas after the guarantee period is over?	Yes	No	
		1	2	
5.6	If yes, who did you call to repair your plant?	Installation company		
		Other company		
		Local technician		
		Others (specify)		
5.7	Did the installation company orient you on general maintenance and repair measures of the biogas digesters?	Yes	No	
		1	2	


6. Benefits of Biogas on Sustainable Development Indicators

Q.N.	Question	Coding Categories	Skip
------	----------	-------------------	------

Biogas Users Survey 2017/18 for Nepal Biogas Support Program					
Q.N.	Question	Coding Categories		Skip	
6.1	Do you think the smoke in your kitchen has reduced after the installation of biogas?	Drastically reduced	1		
		Reduced	2		
		Not reduced	3		
		Do not know	4		
6.2	How have you perceived the incidence of following diseases after the installation of biogas plant?	Diseases	1= Reduced 2= NotReduced 3= Don't know		
		Eye infection			
		Respiratory diseases			
		Cough			
		Fire related injury			
		Others (specify)			
6.3	Did you have the incident of fire as a result of biogas plant?	Yes	No		
		1	2		
6.4	Has the mosquito breeding increased in your surrounding after the installation of biogas plant?	Yes	No		
		1	2		
6.5	Do you think due to biogas installation the time required to collect fuelwood has been saved?		Yes	No	
		Men	1	2	
		Women	1	2	
		Children	1	2	
6.6	Do you think due to biogas installation the time required to cook has decreased?		Yes	No	
		Men	1	2	
		Women	1	2	
		Children	1	2	
6.7	How do the men and women in your family members utilize saved time? (Multiple response)	Working in the farmland		1	
		Helping children with their studies		2	
		Cleaning house		3	
		Income generating activities		4	
		Recreational activities		5	
		Social activities		6	
		Others (specify)		7	
6.8	Do you use the bio-slurry manure?	Yes	No		
		1	2		
6.9	In what form do you use the slurry manure?	Slurry as it is		1	
		After composting		2	
		Use after drying it		3	
6.11	After the using of slurry manure what is the impact on the productivity of crop?	Increased productivity		1	
		Decreased productivity		2	
		No effect		3	
		Don't know		4	
6.12	Could you estimate the amount of following before and after the use of bio-slurry?	Manure	Before (KG)	After (KG)	
		Farm yard manure			
		Bio-slurry			
		Urea			
		DAP			
		Potash			
		Others			
6.13	Do you have toilet at your house?	Yes	No	If No, Go to 7.1	
		1	2		
6.14	When did you construct toilet?	Before biogas installation	After biogas installation		

Q.N.	Question	Coding Categories		Skip
		1	2	
6.15	Have you attached the toilet with your biogas plant?	Yes	No	
		1	2	
6.16	Why did not your attached the biogas to the toilet?	Company did not suggest	1	
		Due to additional cost	2	
		Fear of bad smell	3	
		Socio-cultural reasons	4	
		Others (specify)	5	

7. Investment on Biogas Plant and Users' Satisfaction

QN	Question	Coding Categories		Skip
7.1	How did you manage the money to install the biogas plant?	Self investment	1	
		Loan from village lender	2	
		Loan from Financial institutions	3	
7.2	What kind of subsidy did you receive to install your plant?	Appliances support	1	
		Construction materials	2	
		Labor cost	3	
		Don't know	4	
		Didn't receive any subsidy	5	
7.3	Is the gas produced from your digester is sufficient for you?	Sufficient	1	
		Occasionally Insufficient	2	
		Sufficient only in summer	3	
		Not sufficient throughout	4	
7.4	Are you satisfied with the performance of your biogas digester?	Yes	No	If Yes, END
		1	2	
7.5	Any reason why are you not satisfied with the biogas plant?			
7.6	<u>Other Key observations:</u>			

Annex 3: Orientation schedule and attendance

BIOGAS USERS SURVEY 2017/18

ORIENTATION SCHEDULE

SN	Content	Methodology	Resource Person	Time (mins)
Day 1 (10:00 am to 5:00 pm)				
1.1	Introduction of the client representative (AEPC), consultant team and enumerators.	Introductory	AEPC, Consultant Team, Enumerators	10:00 – 10:15
1.2	Introduction to biogas technology, structural components of biogas, factors affecting its operation.	Lecture/ Discussion	Prem Pokhrel (AEPC)	10:15 – 10:45
1.3	Introduction to CDM, biogas as CDM project, major monitoring parameters of biogas CDM project, objectives of BUS and expected output from consultant.	Lecture/ Discussion	Prem Pokhrel (AEPC)	10:45-11:15
1.4	AEPC's experience in handling previously conducted BUS and expectation from present BUS.	Discussion	Prem Pokhrel (AEPC)	11:15 – 12:00
1.5	Outline of BUS Questionnaire, Sampling Strategy, Sampling No., Critical points	Lecture	Sujesh Shrestha/ Rajendra Man Shrestha	12:00 - 13:30
1.6	Lunch Break	13:30 – 14:00		
1.7	Detailed discussion in questionnaire (step-by-step orientation) with guidance on data collection procedure.	Lecture/ Discussion	Sujesh Shrestha/ Rajendra Man Shrestha	14:00 – 16:00
1.8	Mock Exercise on Questionnaire Filling	Group Work	Participants	16:00 – 16:45
1.9	Participant preparation for pretesting field visit for subsequent day	Field Planning	Sujesh Shrestha	16:45-15:00
Day 2 (10:00 am to 5:00 pm)				
2.1	Field visit to biogas plants in Bhaktapur District by enumerators	Field Visit	Consultant/ Enumerators	08:00 to 13:30
2.2	Lunch Break	13:30 – 14:00		
	Return Back			
Day 3 (10:00 am to 1:00 PM)				
3.1	Experience sharing from the enumerators about pretest visit	Discussion	Enumerators	10:00 – 10:30
3.2	Comparative discussion and review on questionnaire filled by all enumerators; difficulties observed in questionnaire	Discussion	Sujesh Shrestha, Rajendra Man Shrestha Enumerators	10:30 – 11:30
3.3	Loop hole identification and corrective suggestion for individual enumerator while filling data	Lecture/ Discussion	Sujesh Shrestha	11:30 – 12:00
3.4	Site and sample allocation for enumerators according to district, questionnaire distribution.	Field Planning	Sujesh Shrestha/ Rajendra Man Shrestha	12:00 – 13:00

Prakriti Consult Pvt. Ltd.
Biogas User's Survey 2017/18
Orientation Program for the Enumerators

Attendance Sheet

SN	Name	Address	Signature		
			Day - 1 (12 February, 2018)	Day - 2 (13 February, 2018)	Day - 3 (14 February, 2018)
1	Saroj Adhikari	Dhading			
2	Madhav Dhakal	Ramechhap			
3	Tulsi Giri	Kathmandu			
4	Suraj Chhetri	Nawalparasi			
5	Anup Basnet	Lamjung			
6	Shishir Paudel	Bardiya			
7	Sundar Tamang	Kathmandu			
8	Pratima Baral	Kathmandu			
9	Amit Chhetri	Morang			
10	Man Kumar Dhimi	Kanchanpur			
11	Maya Theeng	Malawangpur			
12	Yatra Bahadur Darai	Tanahu			