

Final Version

Submitted to:

Executive Director,
Alternative Energy Promotion Center,
Khumaltar, Lalitpur

Final Inception Report on
Annual Biogas Users' Survey for 2008/09
(CDM (Project-1))

Submitted by:

Integrated Resource Management Consultancy
(IRMC) Pvt. Ltd., Shankhamul, Naya Baneshwor,
GPO Box 6621, Kathmandu
Tel: 4783 597, e-mail: cocis@ntc.net.np

15 June 2009

Table of Contents

1. INTRODUCTION	1
1.1 Background.....	1
1.2 Rationale.....	1
1.3 Objectives of Study.....	1
1.3.1 The specific objectives of the Section-I of the survey.....	2
1.3.2 The specific objectives of Section-II.....	2
1.4 Scope of Assignment.....	2
1.5 Expected Outputs/Deliverables of the Study.....	2
2. REVIEW OF RELEVANT LITERATURES	3
2.2 The Role of BSP-Nepal.....	3
2.3 Description of CDM Projects Activities.....	4
2.4 Geographical Coverage of Biogas Plants Registered under CDM Project-1.....	4
3. METHODOLOGICAL APPROACH	5
3.1 Secondary Sources.....	5
3.2 Primary Sources.....	5
3.3 Development of Study Matrix.....	6
3.4 Field Survey.....	6
3.4.1 Sampling Framework.....	6
3.4.2 District Selection.....	7
3.4.3 Estimation of Sample Size for Household Survey.....	7
3.4.4 Allocation of Sample Size.....	8
3.4.5 Identification of Sample Households or Plants for Survey.....	10
3.5 Data Collection.....	10
3.5.1 Development of Questionnaires and checklists.....	10
3.5.3 Pre-Testing the Questionnaires/Checklists.....	11
3.6 Proposed Tools and Techniques for Users' Survey.....	Error! Bookmark not defined.
3.6.1 Household Survey.....	11
3.6.2 Interactions with Concerned Stakeholders.....	Error! Bookmark not defined.
3.7 Revised Activity Schedule.....	11
3.8 Composition of Field Study Team.....	12
3.9 Analysis and Interpretation of Data.....	13
3.10 Report Preparation and Submission.....	13

1. INTRODUCTION

1.1 Background

Biogas technology was introduced in Nepal since 1955 and the Government of Nepal started biogas program in 1975. This program took further momentum in the country from 1992 following the establishment of biogas Support Program (BSP) under the assistance of the Government of the Netherlands. Alternative Energy promotion Center (AEPC) was established in 1996 with an objective of disseminating and promoting renewable energy technology (RET) for improving living standard of rural people, providing the clean energy and conserving environmental degradation. BSP came under the umbrella of AEPC and this program has been implemented by BSP-Nepal since 2003. With support of GoN, KfW and SNV/N, more than 170,000 household-size biogas plants have been installed in the country covering 67 districts. Out of total biogas plants installed 19,396 (9708 under Activity-1 and 9688 biogas plants under Activity-2) from November 2003 to April 2005 have been registered with CDM in Nepal.

The success of Biogas Sector Program can not be judged merely by the quantitative figures of biogas plants, but the functioning of installed plants is very important. On the other hand, various direct and indirect but important benefits enjoyed by the users of biogas technology may be taken into consideration. It is imperative to know and document to what extent the users of biogas, who are the ultimate beneficiary of the program, have derived perceived benefits from the installed plants and the program as whole and to what extent they are satisfied with the technology. It is equally important to assess socio-economic impacts brought about by the biogas technology, it is essential to monitor both the technology and its impact on the user satisfaction by conducting appropriate and detailed surveys at regular intervals.

1.2 Rationale

From the fiscal year 1992/93, several studies have been conducted to assess various impacts of biogas as well as to find out the impact of biogas on health and workload of women and children. AEPC through independent Consultant has been carrying out Biogas Users' Survey since 2003. In the context of CDM Project, it is mandatory that the quality of registered biogas plants and overall positive impact of biogas needs to be assured. As per the CDM requirements, the AEPC/BSPN have been conducting the biogas users' survey since 2003 to monitor the effects/impacts of biogas program by hiring suitably qualified external consultant. The Integrated Resource Management Consultancy (IRMC), a national consulting firm, has been awarded the contract on competitive bidding process to carry out the annual biogas users' survey for the fiscal year 2008/09 for AEPC/BSPN. The proposed annual survey will cover the biogas plants registered under the two CDM Projects implemented by the BSP Nepal.

1.3 Objectives of Study

Overall objective of proposed Biogas Users Survey is to make a comprehensive assessment of the impacts of the biogas plants installed insofar on changes on energy consumption pattern, functional/operational status of installed plants, environmental impact and livestock keeping pattern in relation to forest and community benefits.

The survey will include two separate sections: Section-I will primarily focus on emission reductions and energy use patterns, and Section-II will focus on the community benefits generated through the biogas plants.

1.3.1 The specific objectives of the Section-I of the survey

This includes assessing and analyzing the following aspects of biogas:

- Household daily utilization of firewood, kerosene, agricultural residues, animal dung, and LPG for cooking;
- Changes in uses of conventional practices of households after installation of biogas plants;
- Daily plant operation in hour; and
- Accessibility to the sustainable biomass over the period of time.

1.3.2 The specific objectives of Section-II

This includes assessing and analyzing the following aspects of biogas:

- Socio-economic and poverty profile of beneficiary households desegregated by caste/ethnicity and income level of the households;
- Number of beneficiary households that have access to toilets
- Impact of biogas and toilet on health and sanitation;
- Impact on agricultural yields;
- Impact on women; and
- Overall beneficiary satisfaction with the product and process.

1.4 Scope of Assignment

Study of ToR supplied by the client reveals that the consultant will under take the following activities to accomplish the proposed assignment:

- Collect and review relevant documents/reports related to the assignment;
- Design the methodology and information collection tools for market study;
- Conduct field survey to collect reliable data from different sources to validate the objectives of assignment;
- Assess and analyze status of utilization of conventional sources of energies for cooking;
- Document the changes on use of various energy sources after installation of biogas plants;
- Document the operational status of installed biogas plants;
- Assess and analyze the accessibility to the sustainable biomass over the period of time;
- Assess and analyze the socio-economic and poverty profile of biogas users;
- Document the number of beneficiary households that have access to toilets;
- Document the impact of biogas and toilet on health and sanitation at household level;
- Assess the impact of biogas installation on the women members of the users' family; and
- Document overall beneficiary satisfaction with product and process adopted by AEPC/BSPN.

1.5 Expected Outputs/Deliverables of the Study

The consultant will prepare two separate reports for Activity-I and Activity -II of the Nepal Biogas Program. The consultant has selected samples survey districts, and will finalize the allocation of sample to selected districts in consultation with AEPC/BSPN. Based on the collected information, a separate survey report will be prepared for CDM Activity -1 and 2 and submitted as per agreed timeframe. The consultant will prepare and submit following reports/outputs as per agreed schedule:

- i) Draft Report
- ii) Final Report

2. REVIEW OF RELEVANT LITERATURES

Biogas has been recognized as a potential alternate renewable energy source for Nepal. The government has been implementing the Biogas Support Program as a priority national program with the bilateral assistance in Nepal since 1992. The Biogas Support Program in Nepal is being executed by the Biogas Sector Partnership –Nepal (BSP-Nepal), a national non government organization (NGO) with the financial and technical support from SNV/Nepal. BSP –Nepal has successfully implemented Phase I-III since 1992 and constructed over 100,000 biogas plants and currently implementing a six-year BSP Phase -IV from 2003 to 2009. The subsidy component for BSP –IV has been co-funded by KfW, SNV/DGIS and AEPC.

It has been reported that 157, 675 Biogas plants have been constructed with support from BSP – Nepal covering 62 districts of Nepal which accounts just for 8.14 per cent of the total potentiality for biogas plants in Nepal. The target for BSP Phase – IV has been fixed to install additional 117,500 Biogas plants by 2009. The year-wise breakdown of BSP Phase - IV targets and achievements made so far has been presented in Table-1:

Table-2.1: Target and Achievement of Plants Construction under the BSP Phase - IV

Targets and Achievements	2003	2004	2005	2006	2007	2008	2009	Total
Targets	NA	12,000	17,154	21,500	23,500	25,000	18,346	117,500
Achievement	NA	12,000	17,154	17,500	-	-	-	46,654
Gaps				4,000	-	-	-	71, 846

Source: Calculated from BSP database December 2006

2.2 The Role of BSP-Nepal

The Biogas Sector Partnership-Nepal (BSP-Nepal) is a nodal agency for planning, implementation and monitoring Biogas Sector Program in Nepal. The BSP-Nepal has been performing core implementation functions in the field of subsidy administration, sector coordination, product development, research, training and quality control. The BSP-Nepal has already acquired an ISO 9001-2000 certificate for its quality services being provided to the concerned biogas stakeholders involved in biogas sector in Nepal.

BSP has successfully implemented its I-III Phases since 1992 and currently implementing the Phase-IV. The overall objective of BSP-IV is to develop and disseminate biogas as a mainstream Renewable Energy Technology in Nepal. However, the Specific objectives of the BSP-IV are to:

- Develop commercially viable market oriented biogas industry in Nepal;
- Further strengthen the institutions for sustainable development of the biogas sector;
- Stimulate internalization of all benefits of the biogas plant, focusing on gender related impacts of the technology;
- Implement Clean Development Mechanism (CDM) arrangements for the BSP in Nepal;
- Increase the number of quality biogas plants with additional 200,000;
- Ensure the continued operation of all biogas plants installed with BSP-Nepal support; and
- Conduct applied R and D in order to optimize plant operation.

The BSP-Nepal Phase-IV aims to install additional 117,500 biogas plants in Nepal by the end of Phase-IV (July 2003 – June 2009). Besides, other technical supports, approximately 30 per cent capital costs for installation a biogas plant are being subsidized. The capital cost subsidy is

currently funded by a combination of Government budget contribution and bilateral grants from Netherlands DGIS' and KfW Germany.

However, the BSP-Nepal would require considerable additional funds to achieve the scale-up target of its Phase-IV. The World Bank has been supporting the Government of Nepal to implement the scale up plan of BSP-Nepal through the sales of 1,000,000 ER credits to Community Development Carbon Fund (CDCF).

The BSP – Nepal has been implementing Phase - IV since 2003/04 and continues until December 2009. The BSP Nepal has developed a Community Benefits Plan to be monitor whether the anticipated social and environmental benefits accrued from the implementation of various BSP activities have reached to the community level and the project has been successful in achieving its goal.

2.3 Description of CDM Projects Activities

It was reported that 9,708 family size biogas plants installed in 57 districts across Nepal have been registered under the CDM Project-I. The list of biogas plants registered under CDM Projects-1 has been presented in Annex-II.

2.4 Geographical Coverage of Biogas Plants Registered under CDM Project-1

The BSPN database shows that 9,708 biogas plants have been registered with CDM Project-1. These plants are distributed in 57 districts across the country. The district-wise distribution of CDM registered biogas plants shows a wide variation both between the ecological regions and the districts. Based on the altitudinal differences of the districts, the distribution of CDM registered biogas plants, districts have been divided into three ecological regions for study purpose. The list of CDM registered biogas plants by districts has been presented in Annex-II.

Review of BSPN database on distribution of CDM registered biogas plants in districts shows that 57 districts have been covered by CDM Project-I. However, the number of biogas plants registered under the CDM Project in some of the districts is very small and may be excluded from the sampling list. The database also indicates that about two third of the registered biogas plants are from few accessible Hills and Tarai districts of Nepal.

3. METHODOLOGICAL APPROACH

Given the nature, scope, and timeframe for the proposed study, the study team will use a combination of participatory methods and tools for collection of necessary information for validating the objectives of study. The methodology for collection of information will involve both secondary and primary sources. The study team will use both qualitative and quantitative methods for collection of data from primary sources. Qualitative data will be collected using suitable Participatory Rural Appraisal (PRA) tools and techniques appropriate in the situation such as Focus Group Discussions (FGDs), Key Informants' Interview/Survey (KII/KIS), formal and informal interactions/consultation meetings with concerned stakeholders, Interactive Workshops/Seminars, Direct Observation etc. for users' survey. Relevant necessary quantitative data on beneficiary households will be collected through structured household survey questionnaires designed specifically for this purpose.

As suggested in the ToR, information will be collected at three levels namely; household; community; and VDC/District by using a suitable combination of qualitative and quantitative methods such as sample household survey and PRA tools and techniques. A separate data collection tools such as questionnaires/checklists will be used for collection of required information from both primary and secondary sources. The proposed methodological approach and process of conducting the proposed Annual Biogas Users' Survey is briefly described as follows:

3.1 Secondary Sources

It is anticipated that considerable district/VDC level quantitative information relevant to proposed study will be available from various secondary sources in the district. Among others, following documents and reports will be collected and reviewed for gathering relevant information for preparing the final report of the proposed market:

1. Relevant past study reports prepared by AEPC, BSP-Nepal and other agencies involved in promotion of alternative energy sector, particularly Biogas Sector in Nepal;
2. Annual Biogas Users' Survey Reports of previous years available from AEPC/BSPN;
3. Other relevant reports and documents.

Among others, following documents and reports have been reviewed for preparation of this inception report:

- Annual Biogas Survey Reports for 2006/07 and 2007/08;
- Final Report on Verification of Community Benefits Plan of the Biogas Sector Program, Nepal, Phase-IV, 2007;
- GPOBA Outputs Report of BSPN, 2009

Other relevant information available from above secondary sources will be collected, reviewed and analyzed and used for triangulation of information collected from different primary sources while preparing the study report.

3.2 Primary Sources

IRMC believes that information collected from available secondary sources will not be adequate for documenting the existing situations on all the dimensions/issues intended to be covered by the proposed biogas user survey. Even if the data are available, the information may not be

segregated to the desired level of inquiry. Therefore, it becomes necessary to collect additional information from primary sources to update and supplement the data collected from different secondary sources in order to validate the objectives of study to assess existing performance of installed biogas plants and analyze the impact of biogas program on carbon emission reduction rates.

Therefore, attempt will be made to collect adequate information from primary sources in order to document the operational status of installed biogas plants, anticipated impacts of biogas program on environment, mainly through reduced consumption of biomass non renewable fuels, indoor-air pollution, and connection of toilet to biogas digesters, workload of women members of the biogas user households. Based on the Terms of References provided for proposed study, relevant information will be collected mainly through household survey using quantitative method. Set of comprehensive pre-tested questionnaires/schedule will be administered to collect the information from sample households in all study districts.

3.3 Development of Study Matrix

Based on the objective of the study, the consultant team prepared a comprehensive Biogas Users' Survey Matrix. The proposed study matrix will be finalized in consultation with concerned AEPC/BSP Nepal Officials. The proposed Study Matrix contains the objectives, indicators/sub-indicators for measuring the objectives of study and tools and techniques to be used for collection of necessary information.

Discussion held with concerned stakeholders at BSPN for estimation of proportion of Non Renewable Biomass (NRB) after switching over to renewable energy sources by the users additional information has to be collected. Such information could be collected from household survey as well as secondary information collected from line agencies and published reports for proving NRB and estimating the proportion of NRB. This means, a blend of both qualitative and quantitative approaches will have to be followed. The proposed methodological approach recommends that information needs to be collected on some additional indicators. The suggested indicators have also been included in the survey framework and adequate information will be collected from both secondary and primary sources.

Based on this study framework, detailed survey questionnaire/checklist have been developed which will be pre-tested and used for collection of adequate information to validate the objectives of the study.

3.4 Field Survey

The consultant team will adopt the following steps in conducting the proposed study:

3.4.1 Sampling Framework

As per the nature of project and objectives of the study, a multi-stage purposive stratified random sampling method will be used to identify representative biogas user households and respondents for users' survey. The methodological approach applied and logical steps used for identifying the sample survey districts and respondents for data collection from households' survey are briefly described below:

3.4.2 District Selection

It has not been clearly mentioned in the ToR how many districts need to be covered by the survey. However, as advised by concerned officials of AEPC/BSPN about 50 per cent districts covered by CDM registered Biogas Plants representing three ecological regions of Nepal has been purposively fixed for survey purpose.

On the basis of ecological criteria, the districts covered under the CDM Project-1 have been further divided into 15 clusters. Then 25 fixed sample districts were proportionately allocated to the 15 clusters and selected using simple random sampling method. The number of districts covered by CDM Project –I and samples study districts selected from three ecological region has been presented in Table-3.3:

Table-3.3: Proposed Stratification Criteria for Detailed Biogas Users Survey

SN	Parameters	Allocation of Survey by Ecological Region			
		Tarai	Hills	High Hills/ Remote Hills	Total
1	Ecological Regions				
2	District covered by CDM Project-1	21	22	10	53
3	Sample districts	10	11	4	25
4	Plant Size (4, 6, 8, & 10 M ³)				

3.4.3 Estimation of Sample Size for Household Survey

After identifying the survey districts, an optimum sample size has been estimated for each stratum separate (ecological region) using the following formula:

$$n = (Z\alpha \times \hat{\sigma}/E)^2$$

Where,

n = Optimum sample size;

Z α = Critical value of Z corresponding to α level of significance (i.e. 99% confidence level = 2.576);

$\hat{\sigma}$ = Population standard deviation; and

E = Permissible error (Sample mean – Population mean).

E is calculated from the following formula:

$$E = (n' - N)$$

Where,

n = Population mean

n' = Sample mean

An optimum sample size for each stratum has been estimated using above formula. Total sample size required for monitoring the registered biogas plants under CDM Project-I have been determined by summing up the samples calculated for three strata (ecological regions). Estimated optimum sample size for each three strata has been presented in Table-3.4.

Table-3.4: Estimated Samples for Household Survey with Stratification

SN	Parameters	Allocation of Survey by Ecological Region			
		Tarai	Hills	High Hills/ Remote Hills	Total Sample
1	Ecological Regions				
2	District covered by CDM Project-1	21	22	10	53
3	Sample districts	10	11	4	25
4	Total CDM Registered Biogas Plants	5186	3995	527	9708
5	Estimated Sample Size for each region	40	165	294	499
	Sampling %	5.34	4.68	6.64	5.14
	Contingency (10%)	4	17	30	51
	Total Estimated Samples	44	182	324	550

Based on above described formula, total estimated sample size for CDM Project-I is 499. However, 10 percent more samples has been selected through stratified random methods using ORACLE software in case the selected samples were not identified or missing due to various reasons. However, the additional samples will not be included for analysis of data for preparing the survey report.

3.4.4 Allocation of Sample Size

The estimated sample sizes will be allocated proportionately to 15 sample districts selected for household survey. Number of sample allocated to each district is presented in Table-3.5:

**Table-3.5: Allocation Plant Samples by Size and Districts for CDM Project-1
Sampling Framework for BUS under CDM Projects 1**

SN	High Hills	# Registered Plants Under CDM-I	# Sample Plants	# Sample VDCs/NPs
1	Ramechhap	96	16	3
2	Ilam	107	16	4
3	Panchthar	41	6	1
4	Myagdi	26	2	1
	Sub-total High Hills	270	40	9
1	Bhaktapur	60	8	2
2	Dhading	54	4	2
3	Kavre	190	10	4
4	Lalitpur	52	4	3
5	Nuwakot	103	3	2
6	Dhankuta	135	10	4
7	Pyuthan	19	4	1
8	Kaski	573	30	5
9	Palpa	215	10	4
10	Parbat	74	12	3
11	Tanhun	694	70	5
	Sub-total Hills	2169	165	35
1	Bara	124	16	3
2	Chitawan	575	40	6
3	Rautahat	70	8	2
4	Jhapa	707	66	6
5	Sunsari	226	12	4
6	Kanchanpur	469	45	5
7	Banke	148	13	2
8	Dang	352	36	8
9	Nawalparasi	423	30	5
10	Rupandehi	279	28	5
	Sub-total Tarai	3373	294	46
	Total	9708	499	90

3.4.5 Identification of Sample Households or Plants for Survey

The allocated sample households from each 25 sample districts have been identified using stratified random sampling method. The steps involved for identification of sample households/plants from each sample survey district are briefly described below:

Step-1: Selection of Village Development Committees and Municipalities

After selection of sample survey districts, number of Village Development Committees/Municipalities having registered biogas plants covered by the CDM Project –I will be identified from the BSPN database. Then, a proportionate number of VDCs/NPs will be selected randomly from each survey district. The number of VDCs/NPs selected for detailed household survey in each sample district is presented in Table-3.7

The BSPN database shows that the CDM registered biogas plants have been spread over 350 VDCs/Municipalities in 25 sample districts. The data base further shows that number of biogas plants registered under the CDM Project varied widely in these VDCs/NPs in the districts. Therefore, number of sample VDCs/Municipalities were fixed and allocated proportionately to each sample study in each sample district.

Step-2: Allocation of Samples to Selected VDCs/NPs

After allocating the number of samples to each cluster districts, the number of biogas samples was drawn using simple random sampling method by ORACLE software at BSPN.

3.5 Data Collection

Data collection process will involve following steps:

3.5.1 Development of Questionnaires and checklists

The study team will develop separate set of questionnaires/checklists for collection of necessary information from different types of respondents. The questionnaires/Schedules developed for this purpose will be finalized in consultation with concerned officials of AEPC before mobilizing the team for field study. The final set of questionnaire for conducting BUS for CDM Project -1 has been attached in Annex-III.

3.5.2 Recruitment and Orientation to Supervisors and Enumerators

About 3 Supervisors and 12 Enumerators will be hired to assist the Study Team. If possible, Enumerators will be hired from the study districts and given three-day orientation training before mobilizing for field survey. The purpose of orientation to Supervisors/Enumerators is to develop a common understanding among the survey team about the purpose, methodology and outcomes of the proposed survey. The Supervisors/Enumerators will be divided into five sub-groups. In addition to conducting household survey in the assigned study districts, the Supervisors/Enumerators will also physically verify the installed biogas plants and gather necessary information required for validating the objectives of the study. Attempt will be made to deploy an equal number of male and female enumerators/supervisors in the study team.

3.5.3 Pre-Testing the Questionnaires/Checklists

The Questionnaires/Schedules will be pre-tested in similar environment and necessary modifications will be made upon pre-testing and finalize the Questionnaires/Schedules by incorporating the necessary changes in the proposed set.

3.5.4 Household Survey

IRMC will mobilize 12 Enumerators and 6 Supervisors for conducting household survey in the selected 15 sample districts. Each Enumerator will survey about 100 households in the assigned districts.

3.5.5 Quality Control

IRMC is well aware of the need for quality of data collected from survey. Efforts will be made to minimize the likely none sampling error in data collection. The data collection process will be strictly followed and the field activity of Enumerators will be supervised by respective Supervisors. In addition, the professional experts of the survey team will also visit some of the sites to guide the survey team and cross check the data collection process in the field.

3.6 Revised Activity Schedule

Based on the preliminary discussions with concerned stakeholders at AEPC/BSPN the study methodology has been revised and proposed activity schedule has also been revised accordingly. The proposed Activity Schedule of study has been revised on the basis of revised methodology to be used for survey and size of samples to be taken for household survey. The consultants have to put extra efforts to allocate the optimum size of samples for two Activities and prepare a separate set of questionnaires for household survey. The revised Activity schedule has been presented in Table-3.8:

Table-3.8: Revised Activity Schedule

SN	Major Activity	Weekly Activity Schedule											
		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
1	Desk study, planning and orientation work:												
1.1	Consultations/Interactions with concerned Officials of Plan Nepal in Kathmandu.												
1.2	Collect and review relevant documents and reports.												
1.3	Finalize survey methodology and preparation of data collection tools.												
1.4	Submission of Inception Report												
1.5	Recruit and orient supervisors and enumerators, and pre-testing of data tools for field survey.												
2	Field work:												
2.1	Preparation of field mobilization plan												
2.2	Travel to study districts												
2.3	Consultations/Interactions with concerned stakeholders in district.												
2.5	Conduct Field Survey in study District.												
3	Data analysis and preparation of draft report												
3.1	Coding and Analysis of Data												
3.2	Preparation of Draft Survey Report												
3.3	Collection of feedback and comments on the draft report												
3.4	Finalize report incorporating feedback and suggestions.												
4	Submission of Final Study Report												

3.7 Composition of Field Study Team

IRMC has proposed a three-member team for the study with diverse expertise relevant to the proposed study. The proposed Study Team will comprise of one Impact Study Specialist as Team leader and one Socio-economist, and one Statistician, six Supervisors/Research Assistants and 12 Enumerators. In addition, the study team will be backed up by other technical and support staff as and when required. The study team will be sub-divided into six groups to implement the field survey. Each group will consist of one Supervisor/Research Officer and two Enumerators to carry out the field survey.

3.8 Analysis and Interpretation of Data

The study team will collect, aggregate and analyze the information obtained from various sources. The information will be analyzed and presented objective-wise in the report. The study team will consider the relative importance of each question and reliability of the data collected from various sources. The collected data analyzed using suitable statistical measures such as percentage, ratios, mean, standard deviation and standard errors where required for key variables measured for the assessment and analysis of the impacts.

3.9 Report Preparation and Submission

i) Draft Report

Based on the findings of field survey and information collected from relevant secondary sources, the consultant will prepare and submit three copies of Draft Survey Report of within given time schedule of study.

ii) Final Report

The consultant will finalize the draft report after incorporating the relevant comments received from AEPC on the draft report. Five hard copies and one electronic copy of the final report will be submitted to AEPC within specified timeframe of the study.

ANNEX-1: LIST OF CDM REGISTERED BIOGAS PLANTS BY YEAR OF CONSTRUCTION

CDM Project -1						
Year	Month of Installation	10	4	6	8	Total
2003		2	84	480	63	629
	November	1	14	88	3	106
	December	1	70	392	60	523
2004		115	1411	6515	1038	9079
	January	10	150	781	98	1039
	February	14	222	1051	183	1470
	March	33	267	1294	176	1770
	April	23	321	1369	235	1948
	May	21	306	1345	238	1910
	June	14	145	675	108	942
	Total	117	1495	6995	1101	9708

Source: BSP Nepal 2009

ANNEX-II: NO. OF REGISTERED BIOGAS PLANTS COVERED BY CDM-1 BY DISTRICT

SN	District	# Plants	SN	District	# Plants
1	Baitadi	1	30	Palpa	215
2	Sindhupalchowk	29	31	Parbat	74
3	Dandeldhura	10	32	Pyuthan	19
4	Darchula	29	33	Sindhuli	200
5	Dolakha	112	34	Syangja	273
6	Ilam	107	35	Tanahun	694
7	Myagdi	26	36	Udayapur	91
8	Panchthar	41	37	Banke	148
9	Ramechhap	96	38	Bara	124
10	Rasuwa	23	39	Bardiya	264
11	Sankhuwasabha	31	40	Chitawan	575
12	Solukhumbu	10	41	Dang	352
13	Taplejung	9	42	Dhanusha	13
14	Terhathum	3	43	Jhapa	707
15	Arghaghanchi	21	44	Kailali	571
16	Baglung	11	45	Kanchanpur	469
17	Bhaktapur	60	46	Kapilvastu	220
18	Dhading	54	47	Mahottari	45
19	Dhankuta	135	48	Morang	398
20	Doti	3	49	Nawalparasi	423
21	Gorkha	171	50	Parsa	21
22	Gulmi	74	51	Rautahat	70
23	Kavre	190	52	Rupandehi	279
24	Kaski	573	53	Saptari	10
25	Kathmandu	70	54	Sarlahi	181
26	Lalitpur	101	55	Siraha	11
27	Lamjung	249	56	Sunsari	226
28	Makwanpur	612	57	Surkhet	81
29	Nuwakot	103		Total	9708

Source: BSP Nepal 2009

**ANNEX-III: QUESTIONNAIRES FOR BIOGAS USER HOUSEHOLDS SURVEY
BIOGAS USERS SURVEY 2008/09 (2065/66)**

1.0	General Information		
100	Characteristics of Respondents		
101	Name of the respondent	Mr./Mrs.....	
102	Name of the Biogas plant owner	Mr./Mrs.....	
103	Date of interview	/ /2009 (/ /2066)	
110	Location of the Household		
111	District:		
112	VDC:		
113	Village/Tole:		
114	Ward No:		
115	Walking distance from road head	.....day.....hour.....min.	
116	Distance to water source	.....meter/ft. (minute.....)	
1.20	Identification of Biogas Plant		
121	BSP plant code no./file no./...../...../	
122	Dome Gas Pipe No. or Fiscal Year	.....Number Year	
123	Plant Owner's Booklet No.		
124	Name of Biogas Company		
125	Date of biogas plant installed	.....Year.....Month	
126	Capacity of biogas plant	.....cubic meter	
1.30	General Observation		
131	Type of house (Tick one)	1. Thatched roof 2. Corrugated sheet roof 3. Stone/tile roof 4. Mixed roof 5. Cemented roof	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
132	Whether house is connected with electricity (Tick one)	1. Yes 2. No	<input type="checkbox"/> <input type="checkbox"/>
133	Communication/Information source (Tick as required)	1. None 2. Radio 3. Television 4. Mobile phone 5. Others (specify).....	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
134	Transportation means (Tick as required)	1. None 2. Cycle 3. Motorcycle/scooter 4. Bullock/Tire cart 5. Others (Specify).....	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

1.40 Characteristics of Respondent of Household						
141	Sex of the family head (Tick one)	1. Male				
		2. Female				
142	Main occupation of the family head (Tick one)	1. Agriculture				
		2. Business				
		3. Service				
		4. Industry				
		5. Others (specify).....				
143	Family size (Number)	Male	Female	Children ¹	Total	
144	Educational status of respondent's family (Above 5 years only)	Educational level		Male	Female	
		1. Illiterate				
		2. Literate				
		3. Class 1 to 5				
		4. Class 6 to 10				
		5. SLC				
		6. Above SLC				
		7. Plus 2/IA				
		8 BA or above				
2.0 Households' Energy Sources						
2.10 Energy Sources for Lighting						
211	Fuel source for lighting besides biogas	Sources	Quantity			
			Before biogas	After biogas		
		1. Kerosine (liter/month)				
		2. Electricity (unit/month)				
		3. Candles (Rs/month)				
		4. Solar Panel	Yes <input type="checkbox"/>	No <input type="checkbox"/>		
		5. Others (specify).....				
2.20 Energy Sources for Cooking						
221	Sources of energy for cooking before and after the installation of plant (Tick as required)	Energy Sources	Before biogas		After biogas	
			Summer	Winter	Summer	Winter
		1. Fire wood (Bhari/month)				
		2. Crop residues (kg/month)				
		3. Dung cake (Kg/month)				
		4. Char Coal (Kg/month)				
		5. Saw dust (Kg/month)				

¹ Children : below six years

		6. Kerosene (liter/month)				
		7. L.P.G.(cylinder/year)				
		8. Electricity				
222	Changes in consumption conventional energy sources at household level.	Potential Energy Sources	Increased	Decreased	Same	
		1. Fire wood (Bhari/month)				
		2. Crop residues (kg/month)				
		3. Dung cake (Kg/month)				
		4. Char Coal (Kg/month)				
		5. Saw dust (Kg/month)				
		6. Kerosene (liter/month)				
		7. L.P.G. (Cylinder/year)				
		8. Electricity				
		9. Others (specify).....				
223	What are the prevailing prices of energy sources in the locality? Bhari = kg Doko = kg Thunche = kg Head load = Kg Tokari =Kg	Fuel	Rs/Unit	Unit		
		1. Firewood		Bhari/month		
		2. Agricultural residues		Bhari/month		
		3. Dung cake		Kg/day		
		4. Saw dust		Kg/day		
		5. Charcoal		Kg/day		
		6. Kerosene		Liter/month		
		7. LPG		Cylinder/month		
		8. Electricity		Per month		
224	Changes in the type of biomass collected by users over the years.	Types of fuel wood used	Increased	Decreased	No change	
		1. Woody biomass				
		2. Twigs and branches				
		3. Non woody biomass				
		4. Agricultural residues				
		5. Charcoal				
		6. Cow dung				
		7. Saw dust				
2.30	Biomass Use Patterns in Communities					
231	Where do you generally collect the fire wood? Please mention the quantity collected by sources.	Sources			Bhari/Kg)	
		1. Government forest				
		2. Comunity forest				
		3. Private forest				
		4. Others specify				
232	Harvesting methods of fuel wood.	Methods of harvesting	Sources of fuel wood collection			
			Government	Community	Private	
		1. Pruning of branches				

		2. Thinning of trees			
		3. Felling of trees			
		4. Others specify			
233	What impacts you have observed on the forest due to firewood collection?	Forest Condition	Tick		
		1. Forest area decreased			
		2. Forest has been degraded.			
		3. Do not know			
		4. Other specify			
234	What could be the main reasons for degrading the forest from where you have been collecting firewood?	Main reasons	Tick		
		1. Felling of trees for firewood			
		2. Use of timber by communities			
		3. Selling of firewood & timber by communities			
		4. Selling of bigger timber			
		5. Harvesting of fodders by communities			
		6. Flooding and erosion by river			
		7. Other specify			
235	What changes have been observed in following aspects of firewood use?	Now (2066)	Before10 Years (2056)	Before 20 Years (2046)	
	Time required for collection of one head load firewood in village (Time/Hour)				
	Distance to be traveled for collection of firewood in village (Km/Meter)				
	Prices of one head load of firewood in the locality? (Rs/Unit)				
236	Had you experienced that the quality of fire wood has been deteriorated over time	Yes	No	Yes	No
237	Have you been using low quality biomass due to lack of availability and high prices for quality firewood?				
238	Weapons used for firewood collection?	Tick one	Tick one	Tick one	
	1. Sickle				
	2. Axe				
	3. Hand Saw				
	4. Machine Operated Saw				
	5. Other specify				
239	How do you generally bring the firewood from the collection sites?	Means of Transport			Distance (Km/Hour)
		1. Carry on head load and foot			
		2. Bicycle			
		3. Cart			
		4. Tractor/Truck			
		5. Other specify			
240	Is the forest has been sustainably managed/protected	1. Yes	2. No	3. Do not know	

241	If yes, which agency or organization is conserving the forest? (Provide the Name of Agency involved)	1. Local body: 2. Government agency: 3. I/NGOs/CBOs:
242	Had the conservation initiatives helped conserve the forest?	1. Yes 2. No
243	If yes, what is impact of these conservation efforts on the forest?	1. Completely conserved
		2. Conserved to some extent
		3. Not controlled at all.
		4. Do not know
244	What impacts have been observed due to implementation of local conservation initiatives and national legislations on availability of fire wood for the community?	1. Increased firewood collection time for communities
		2. Increased prices for firewood in the villages
		3. Decreased quality of available firewood
		4. Use of low quality firewood has increased
		5. None of the above

245	Could you tell how much fuel wood is used by your family in a year? (kg/year).	Sources of Biomass	Quantity	Unit	Rate/Unit
		1. Government Forest			
		2. Community Forest			
		3. Own land/Forest			
		4. Purchased			
246	Could you tell how much timber is used by your family in a year? (cft/year)	1. Government Forest			
		2. Community Forest			
		3. Own land/Forest			
		4. Purchased			
		5. Other sources			
247	Had you sold any timber and fuel wood last year?	1. Fuel wood sold			
		2. Timber/wood sold			
248	Did you purchase any fuel wood and timber used during last year?	1. Fuel wood sold			
		2. Timber/wood sold			

3.00	Biogas Plant Operation and Maintenance				
310	Operation of Biogas Plant (Hour/Day)	Morning Tea	..... Hour	..... Minute	
		Morning Meal	..... Hour	..... Minute	
		Evening Tea	..... Hour	..... Minute	
		Evening Meal	..... Hour	..... Minute	
		Others Specify	..... Hour	..... Minute	

3.20 Repair and Maintenance of Plant								
321	How often gas production is affected due to failure of biogas appliances? (Tick appropriate appliances and fill number in other boxes)	Appliance Failure			Repaired			
		Appliance	Frequency of failure	How many years	By Company	Self		No repair
						M	F	
		1. Mixer						
		2. Main Valve						
		3. Gas pipe						
		4. Water drain						
		5. Rubber hose						
		6. Gas taps						
		7. Stove						
8. Biogas lamp								
9. Pressure gauge								
322	Breakage and crackdowns in civil structures (Tick as required)	Structure	Frequency	Per year	Repaired by			
					Company	Self		No repair
						M	F	
		1. Inlet pit						
		2. Toilet						
		3. Dome						
		4. Digester						
		5. Water Drain pit						
		6. Water drain pit cover						
		7. Outlet						
8. Outlet cover								
9. Other specify ...								
323	Have you noticed gas leaking from plant/ pipe/stove? (If No, go to Q. No. 329)	1. Yes 2. No 3. Do not know						
324	If yes, how long gas was leaking?	.....month .....day						
325	What have you done to stop this? (Tick one)	1. Informed the concerned authority/company Repaired the leaking point 2. Informed to BSP-N 3. Others (specify).....						
326	Has the gas use time decreased because of leakage?	1. Yes 2. No						
327	If yes, by how long time?	.....Hr .....Min.						
328	How do you find out about leakage? (Tick one)	1. Smell 2. Using soap water 3. Decrease in burner flame 4. Others (specify).....						

329	Annual expenditure for repair & maintenance of plant (last year)	1. Appliances (Rs)..... 2. Civil structure (Rs).....		
3.30	After sales services of Biogas Company			
331	Had you been receiving timely repair services from biogas company? (If No go to Q. No. 332)	1. Yes 2. Yes, but delayed 3. No		
331	How promptly the company provides service after lodging the complaint? (Tick one)	1. Three days 2. One week 3. Two weeks 4. Three weeks 5. More than three weeks		
332	Had you received any training from the Biogas Company?	1. Yes 2. No		
333	If yes, on what? (Tick as required) (If No go to Q. No. 3.40)	1. Plant use 3. Repair and maintenance 2. Health and sanitation 4. Slurry management		
334	Who had received the training in your family?	1. Husband 2. Wife 3. Others (Name).....		
335	Can you undertake repair and maintenance of plant yourself?	1. Yes 2. No 3. Can not say		
336	Did company visit after installation of biogas plant? (If No Q. No. 3.40)	1. Yes 2. No		
337	If yes, mention the frequency of visits	Frequency of visit/year	Regular	Invited
		1. Once 2. Twice 3. Thrice 4. More than three time		
338	Had the company recommended any device for removing pungent smelling gas (H ₂ S)?	1. Yes 2. No		
3.40	Gas Production from the Plant			
341	Number of stoves	1. One stove 2. Two stoves 3. More than two stoves		
342	Number of biogas lamps (Tick one)	1. No lamp 2. One lamp 3. Two Lamps More than two lamps		
343	Daily consumption of gas for cooking (hrs/day)	Season	# of Stoves in use	Total cooking time (Hour/Minutes)
		Summer		
		Winter		
344	Daily consumption of gas for lighting (hrs/day)	Season	# of Lamps in Use	Total lighting time (Hour/Minutes)
		Summer		
		Winter		
345	Is the gas sufficient? (Tick one)	1. Always sufficient 2. Never sufficient 3. Sufficient only in summer		

346	What do you do to increase gas production? (Tick as required)	1. Increase feeding 2. Feed after heating in the sun 3. Cover the dome with mud or straw 4. Attach toilet with the plant 5. Do nothing 6. Other materials fed to plant, (specify)		
3.50 Cooking performance				
351	Are you satisfied with cooking in biogas? (Tick one)	1. Fully satisfied 2. Satisfied 3. Not satisfied		
352	If fully satisfied, give the reasons: (Tick as required)	1. Smokeless cooking 2. Fast cooking 3. Tasty food 4. Easy and fast dish washing 5. Constant watching not necessary 6. Others (specify).....		
3.60 Lighting (Only if lighting provisioned)				
361	Are you satisfied with biogas lamp?	1. Yes To some extent Not at all		
362	If yes, what are the reasons for your satisfaction? (Tick as required)	1. Bright light 2. Easy to use 3. Cheaper 2. Others (Specify).....		
363	If not, what are the reasons for your dissatisfaction? (Tick one)	1. Frequent breakage of lamp net 2. Frequent breakage of glass 3. Difficult to light 4. Not transferable 5. Others (Specify).....		
4.0 Impact of Biogas Installation on Family Health and Households' Sanitation				
4.10 Toilet				
411	Have you constructed toilet in your house? (If No go to Q. No. 414)	Before biogas		After biogas
		1. Yes 2. No	1. Yes 2. No	
412	If yes, do you have attached the toilets with biogas plant?		1. Yes 2. No	
413	If not attached toilet, what is the reason?	1. Company did not suggest 2. Extra cost burden 3. Socio-cultural reason (specify) 4. Others (specify).....		
414	Has the amount of smoke in the kitchen reduced after biogas installation? (Tick one)	1. Not reduced 2. Reduced to some extent 3. Reduced to a great extent		
4.20 Diseases and Fire Related Accidents				
421	Has any member of your family suffered from fire related accident during the last 12 months?		1. Yes 2. No	
422	If yes, who were they?	Number of persons affected by fire hazards		
		Sex/Age Class	Elderly people	Adult Children
		Male		
	Female			
423	Perceived incidence of	Illness and Disease		Number of persons

			Male	Female	Children			
		1. Eye infection						
		2. Respiratory diseases						
		3. Cough						
		4. Diarrhea						
		5. Dysentery						
		6. Round worm/parasitic infection						
		7. Encephalitis						
		8. Malaria						
		9. Headache						
		10. Tuberculosis						
		11. Fire related accident						
		12. Others(specify)						
4.30	Use of Organic Residues, Slurry and Compost Manure							
431	Do you use slurry manure?	1. Yes 2. No						
432	If you are using slurry manure, in what way are you using it? (Tick one)	1. Slurry as it is 2. Making compost 3. After drying						
433	What are the impacts of slurry manure application on the incidences of insects and diseases on crops?	1. Decreased 2. Increased 3. No effect 4. Do not know						
4.40	Changes observed in the productivity of land after biogas installation by land category							
	Land types	Increased	Decreased	Remained Same				
441	Lowland							
442	Upland							
443	Kitchen garden							
4.50	Use of Manures and Fertilizers (1, Bhari =.....kg, 2) Bucket =.....litre)							
	Manures and Fertilizers	Lowland		Upland		Kitchen garden		
		Before	After	Before	After	Before	After	
451	Manure (Bhari)							
452	Bio-slurry (Bucket)	-		-		-		
453	Slurry compost (Kg/Doko)	-		-		-		
454	Urea (Kg/Ha/Crop)							
455	DAP (Kg/Ha/Crop)							
456	Potash (Kg/Ha/Crop)							
457	Others, specify (Kg/Ha/Crop)							
458	After using slurry/compost, what are the changes observed in soil fertility? Can we ask for some reference examples on this, if possible?					1. Increased 2. Decreased 3. Same		
4.60	Time utilization by family members (Hour/Minute/day)							
461	How much time is saved of family members after	Activity			Male		Female	
					Adult	Children	Adult	Children

		1. Firewood collection				
		2. Cooking				
		3. Washing dishes				
		4. Other specify				
462	How the saved time is utilized by the members of your family after biogas installation? (Tick as required).	1. Literacy classes				
		2. Listening Radio/Watching TV				
		3. Reading newspapers				
		4. Social works				
		5. Recreation				
		6. Others (specify)				
463	Is saved time used for any IGAs /productive works?	1. Yes 2. No				
464	If yes, what type of works?	1. Kitchen gardening	2. Cash crops			
		3. Livestock	4. Others specify			
4.70	Plant Feeding					
471	How many times in a day dung is fed into the plant? (<i>Measure if necessary and ask the person who performs the job</i>) (Tick one)	1. Once a day .....kg/feeding 2. Twice a day .....kg/feeding 3. Every second day .....kg/feeding 4. Twice a week kg/feeding 5. Once a week kg/feeding				
472	If all the available dung is not fed into the plant, what could be the reason?	1. Gas is sufficient 2. Fear of reduction in quality of FYM 3. Lack of time 4. Others (specify).....				
473	What types of materials are fed to plant other than dung.	1. Night soils 3. Pig dung 2. Poultry droppings 4. Others (Specify).....				
474	Additional water required after installation of biogas at the household	1. For family :litre/day 2. For mixing dung .....litre/day 3. For livestock .....litre/day 4. Others (specify).....				
475	Usually who feeds into the biogas plant? (Tick one)	1. Male member of the household 2. Female member of the household 3. Domestic Helper				
5.00	Overall performance of Biogas plant					
510	Are you satisfied with biogas plant?	1. Yes 2. No				
512	If No, what are the reasons of your dissatisfaction?	1. Problem in company dealing 2. Problem in bank dealings 3. Others (specify).....				
513	Is plant currently producing gas?	1. Yes 2. No 3. If no, since how long? .....days				
514	Did gas production was ever stopped in the past?	1. Yes 2. No				

515	If yes, for how long the gas production was stopped?	..... Month Days
516	What could be the reasons for stopping the gas production?	1. No feeding 2. Failure of appliances 2. Damaged structure 4. Do not know.
517	Has the biogas company made any commitment for improved services?	1. Yes 2. No
5.20	What are your suggestions to improve the overall performance of biogas?	
	1. 2. 3	

Signature:

Name of Interviewer: **Date:**