



**MONITORING REPORT FORM (F-CDM-MR)**  
**Version 02.0**

**MONITORING REPORT**

<b>Title of the project activity</b>	Bagepalli CDM Biogas Programme
<b>Reference number of the project activity</b>	0121
<b>Version number of the monitoring report</b>	I
<b>Completion date of the monitoring report</b>	12/12/2012
<b>Registration date of the project activity</b>	10/12/2005
<b>Monitoring period number and duration of this monitoring period</b>	Monitoring Period Number – III Duration of Monitoring Period - First and last days included (01/08/2009 - 31/07/2011)
<b>Project participant(s)</b>	1. Agricultural Development and Training Society, India 2. Velcan Energy, France 3. Velcan Energy, Switzerland 4. Atmosfair gGmbH, Germany
<b>Host Party(ies)</b>	INDIA
<b>Sectoral scope(s) and applied methodology(ies)</b>	Sectoral Scope I; TYPE I - RENEWABLE ENERGY PROJECTS AMS-I.C. Version 5; Thermal energy for the user
<b>Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD</b>	<b>39,106 tCO<sub>2</sub></b>
<b>Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period</b>	<b>33,087 tCO<sub>2</sub></b>

## SECTION A. Description of project activity

### A.1. Purpose and general description of project activity

#### a) Purpose of the project activity and the measures taken for greenhouse gas emission reductions

The purpose of the project activity is to build 5,500 biogas plants (digesters) of 2 m<sup>3</sup> capacities each. Each household uses the dung of cattle to feed the biogas digester for the production of biogas for cooking purpose and hot water bath. The aim of the project is to replace the commonly used inefficient wood fired mud stoves technology, with clean, sustainable and efficient biogas fed devices.

About 75.6% of biomass used for cooking and heating water in Kolar District is non-renewable which means that 75.6 % of the fuel wood cannot be considered a renewable source of energy. By burning this firewood, the users were causing the emission of greenhouse gases in the baseline. In the project activity, fuel wood was replaced with the renewable biogas, thus avoiding greenhouse gas emissions in the baseline.

Each family was using 2.85 t of wood/year of which 2.15 t was non-renewable. Also, per year, 31.2 liters of kerosene was used as additional cooking fuel. The CO<sub>2</sub> emission reduction from avoidance of non-renewable wood usage and kerosene was estimated *ex-ante* at 3.56 tCO<sub>2</sub>/family/year. Thus, the number of CERs generated through the project in one year is basically calculated by multiplying the number of unit operating by the ratio of 3.56.

#### b) Brief description of the installed technology and equipments

The biogas plant (Deenbandhu Model) consists of a digester with a fixed, non-movable gas space. Families load cattle dung through the inlet into the fixed dome made of bricks and cement, located outside the kitchen. Biogas is produced through anaerobic digestion of the dung and stored in the upper part of the digester before being piped to the biogas stove in the kitchen. Users prepare batches of slurry in the mixing tank, before allowing the final mixture to flow into the digester for methane formation phase. The recovered gas is combusted and used for cooking and water heating. The gas pressure displaces the digested slurry into the compensating tank, ready to be used as manure.

#### c) Relevant dates for the project activity (e.g. construction, commissioning, continued operation periods, etc.).

The project was registered on **10<sup>th</sup> December 2005** and the start date of the project activity / crediting period is **1<sup>st</sup> September 2006**.

This is the third monitoring report for the project activity. The details of the earlier monitoring and verification for the project activity are as follows:

Description	Monitoring Period	Biogas Units Commissioned	Net Emission Reductions (tCO <sub>2</sub> )	Status
1 <sup>st</sup> Monitoring Report and	1 <sup>st</sup> Sept 2006 to 31 <sup>st</sup> August 2007	4,399	11,761	Issued



Verification				
2 <sup>nd</sup> Monitoring Report and Verification	1 <sup>st</sup> Sept 2007 to 31 <sup>st</sup> July 2009	5,485	35,872	Issued

The first monitoring report for 2006-07 was for the period 1<sup>st</sup> Sept 2006 – 31<sup>st</sup> August 2007. During this period, 4,399 units were commissioned and the certified emission reductions issued were 11,761 CERs.

The second monitoring report for 2007–09 was for the period 1<sup>st</sup> Sept 2007 to 31<sup>st</sup> July 2009. A total of 5,485 units were commissioned and the certified emission reductions issued were 35,872 CERs.

This is the third monitoring period for the period 1<sup>st</sup> August 2009 to 31<sup>st</sup> July 2011. As of 31<sup>st</sup> July 2011, 5,485 biogas units were constructed and commissioned. (see *Bagepalli\_ER\_Calculations.xls*). Thus of the 5,500 units which were taken up as the CDM project, only 5,485 units were built. The status of the project as on 1<sup>st</sup> August 2009 (first date of this monitoring period) is as follows:

Taluk	Units Commissioned	Number of Villages
Bagepalli	2,617	125
Chickballapur	647	48
Chintamani	1,001	78
Siddalaghatta	840	58
Gudibanda	380	27
<b>Total</b>	<b>5,485</b>	<b>336</b>

No further units were built and only repair and maintenance of constructed units were done during this monitoring period. This is the third monitoring report that corresponds to the period from 1<sup>st</sup> August 2009 to 31<sup>st</sup> July 2011 (inclusive of both days). The monitoring report has been established following the revised monitoring plan submitted and approved by the EB, UNFCCC (PRC-0121-001) on 27<sup>th</sup> September 2012<sup>1</sup>.

The domestic biogas units are in continuous operation after installation. The dates of installation for each of the unit is recorded and included in the excel ER calculations sheet (see *Bagepalli\_ER\_Calculations.xls*). In between, due to repair and maintenance, some of the biogas units may not be in operation. The days not operational is recorded for each of the unit. This information is included in the excel ER calculations sheet (see *Bagepalli\_ER\_Calculations.xls*). The date on which the problem occurred and the problem was fixed is recorded in the village level monitoring sheets and then entered into the online monitoring solution, which is the basis for emission reduction calculations for operational days of the installed units.

**d) Total emission reductions achieved in this monitoring period.**

Summary of the Project Activity and ERs Generated for the Monitoring Period	
Start date of third monitoring period	<b>1-Aug-09</b>
Carbon credits claimed up to	<b>31-July-11</b>

<sup>1</sup> <http://cdm.unfccc.int/PRCContainer/DB/prcp8155416/view>

Emission reduction/unit/yr	<b>3.56</b>
Total Biogas Units Commissioned till 31 <sup>st</sup> July 2011	<b>5,485</b>
<b>Total ERs generated (after subtracting for non-operational days) for 1<sup>st</sup> August 2009 to 31<sup>st</sup> July 2011 (tCO<sub>2</sub>)</b>	<b>33,087</b>

## A.2. Location of project activity

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- a) **Host Party(ies):** Non-Annex I country: India
- b) **Region/ State/Province, etc:** Karnataka State, India.
- c) **City/Town/Community, etc:** Five Taluks of Chickballapur District namely Bagepalli, Chickballapur, Chintamani, Gudibanda and Siddalaghatta.
- d) **Physical/ Geographical Location:**

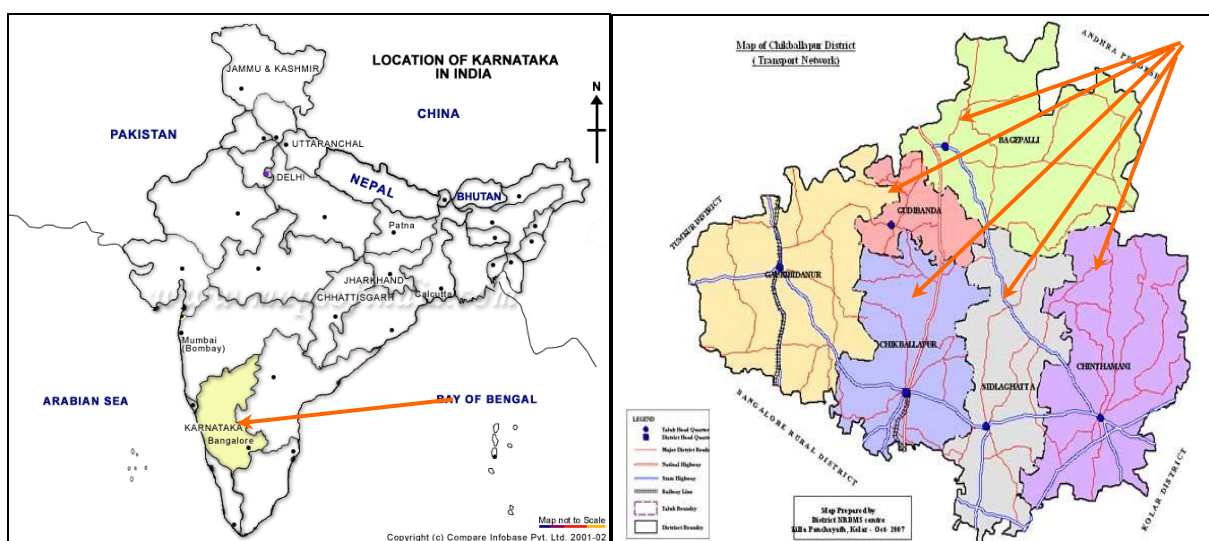


Fig 1: Map showing Karnataka State and the 5 taluks in Chickballapur<sup>2</sup> district where the project is being implemented.

Taluks	Coordinates
Bagepalli	13° 47' 5" North, 77° 47' 35" East
Chickballapur	13° 26' 3" North, 77° 43' 27" East
Chintamani	13° 24' 0" North, 78° 4' 0" East
Gudibanda	13° 40' 10" North, 77° 41' 54" East
Siddalaghatta	13° 23' 17" North, 77° 51' 46" East

The above table gives the GPS co-ordinates of the Taluks where project is being implemented.

<sup>2</sup> 6 taluks of former Kolar district have been separately carved out on 23<sup>rd</sup> August 2007 to form a new district and named Chickballapur district ([http://chikballapur.nic.in/district\\_profile.html](http://chikballapur.nic.in/district_profile.html)). The 6 taluks includes Gowribidanur, Gudibanda, Bagepalli, Chintamani, Sidalaghatta and Chickballapur taluks. Thus the project site is now in Chickballapur district.

### A.3. Parties and project participant(s)

Party involved (host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
India (host)	Private Entity: Agricultural Development and Training Society (ADATS)	No
France (Annex I country)	Private Entity: Velcan Energy	No
Switzerland (Annex I country)	Private Entity: Velcan Energy	No
Germany (Annex I Country)	Private Entity: Atmosfair gGmbH	No

### A.4. Reference of applied methodology

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Sectoral Scope : I; Energy industries (renewable - / non-renewable sources)  
Methodology : AMS-I.C. Thermal energy for the user  
Version : 5

### A.5. Crediting period of project activity

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- a) **Type** : Renewable Crediting Period
- b) **Start date of the crediting period**: 01/09/2006
- c) **Length of the crediting period**: 7 years - 0 months (from 01/09/2006 – 31/08/2013)

## SECTION B. Implementation of project activity

### B.1. Description of implemented registered project activity

#### a) Description of the installed technology, technical process and equipment

The biogas plant of Deenbandhu model (Fig 2) consists of a digester with a fixed, non-movable gas space. Users prepare batches of dung slurry in the mixing tank, before allowing the final mixture to flow into the digester for methane formation phase. By utilizing dung substrate in an anaerobic digestion and combustion system, biogas is made available. Biogas is generated by fermentation of cellulose rich organic matter under anaerobic conditions. In anaerobic conditions, the methane-producing bacteria become more active. The anaerobic digestion consists of three stages: I Hydrolysis; II Acid formation and III Methane fermentation. The processes are carried out by two sets of bacteria namely acid forming bacteria and methane formers. The acidogenic phase I is the combined hydrolysis and acid formation stages in which the organic wastes are converted mainly into acetate, and phase II is the methanogenic phase in which methane and carbon dioxide are formed. The recovered gas is combusted and used for cooking and water heating. The chosen methane recovery and combustion system is the time tested Deenabandhu model biogas technology which is well-known in India.

The individual plant consists of a mixing chamber where waste water and cow dung are mixed, an inlet pipe to feed the slurry into the reactor, the main biogas reactor/digester where methane formation/recovery takes place, a slurry outlet pipe, an outlet chamber, and a slurry platform. The outlet pipe and tank are provided to remove the digested/treated sludge or fermentation residue and the slurry platform is provided to maintain the treated slurry in clean condition. A pipe leading from the top of the dome to the stove will be provided to supply biogas to a 2-ring stove inside the house. The cross-section of a biogas unit is as shown in Fig 2.

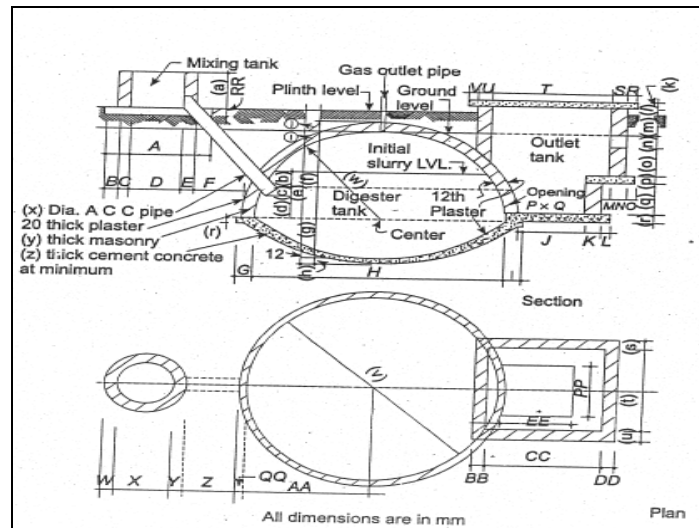
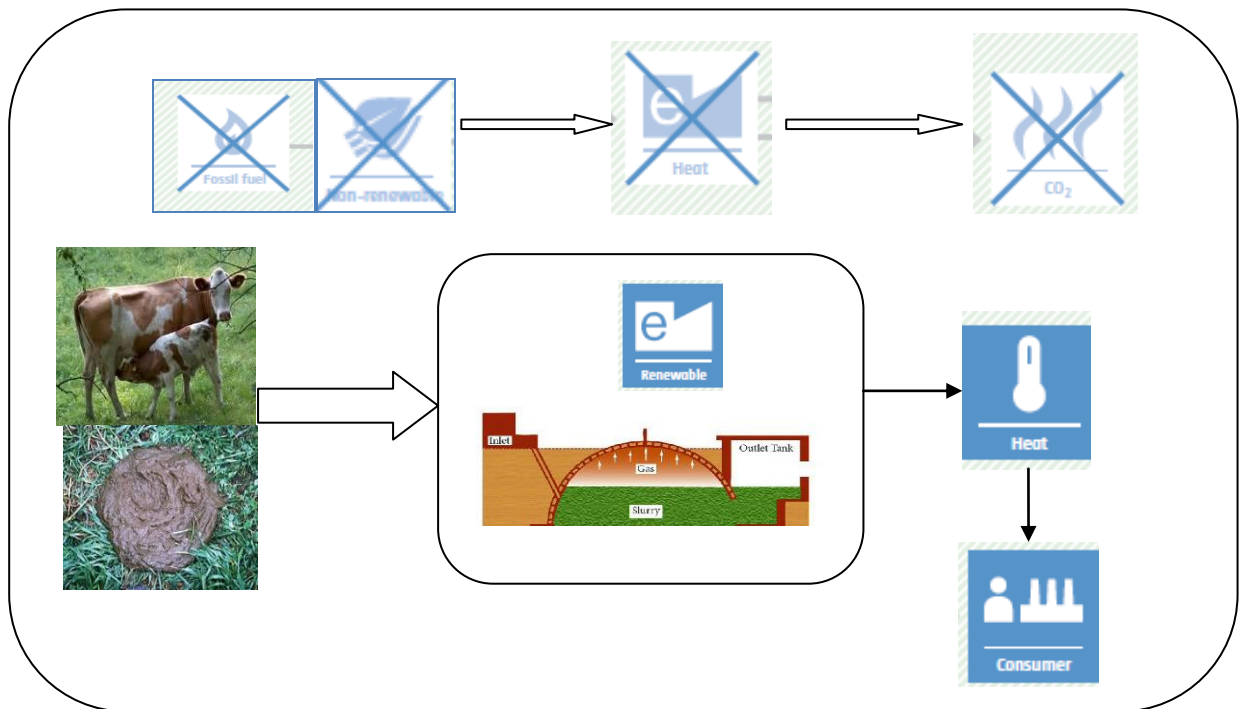


Fig 2: Diagram of a cross-section of the Deenabandhu 2 m<sup>3</sup> biogas model

### Technical process and equipment of biogas unit





Deenabandhu Biogas Unit in construction



Biogas Stove used for Cooking

### B.1.2 Implementation Status of the Project Activity

The Bagepalli Biogas CDM project is implemented by ADATS, a 32 year old rural development NGO, for small and poor peasant families in over 336 villages from 5 taluks i.e. Bagepalli, Chickballapur, Chintamani, Gudibanda and Siddalaghatta of Chickballapur District<sup>2</sup> (formerly Kolar District), Karnataka, India.

The project activity is construction of 5,500 biogas plants in the project area. Of these, 5,485 were built during I and II monitoring periods during 2006-2009. The units were commissioned between 05-Jan 2006 – 05 Feb 2009. The biogas project involves implementation of the technology, maintenance and monitoring the emission reductions. All the tasks and activities are carried out in 16 designated “Areas<sup>3</sup>” comprising of 336 villages. Each Area Team consists of a Field Worker, Case Worker and Mahila Trainers (The organization chart of ADATS can be seen at <http://www.adats.com/misc/Organogram.pdf>). Each Area Team is “in-charge” of the processes in their respective villages.

The construction of biogas plants was done in a phased manner. The details of the units commissioned and operational are as follows:

Taluk	2006	2007	2008	2009	Total
Bagepalli	1411	1108	97	01	2617
Chickballapur	352	293	02	00	647
Chintamani	657	317	27	00	1001
Siddalaghatta	377	324	139	00	840
Gudibanda	203	165	12	00	380
<b>Total</b>	<b>3000</b>	<b>2207</b>	<b>277</b>	<b>01</b>	<b>5,485</b>

The list of beneficiaries, their unique user ID, village, and other details is provided in the enclosed excel file (*Bagepalli\_ER\_Calculations.xls*). The dates of commission of all the 5,485 biogas plants is listed in the excel sheet. The project activity of 5,485 biogas units was implemented in 336 villages of 5 Taluks, Chickballapur district. The status of the project as on 1<sup>st</sup> August 2009 (first date of this monitoring period) is as follows:

<sup>3</sup> Area comprises of a group of villages being overlooked by the Area Team



Taluk	Units Commissioned	Number of Villages
Bagepalli	2,617	125
Chickballapur	647	48
Chintamani	1,001	78
Siddalaghatta	840	58
Gudibanda	380	27
<b>Total</b>	<b>5,485</b>	<b>336</b>

No further units were built and only repair and maintenance of constructed units were done during this monitoring period.

The domestic biogas units are in continuous operation after installation. In between, due to repair and maintenance, some of the biogas units were not be in operation for different durations of time. For each of the unit, the days not operational, is recorded. This information is included in the excel ER calculations sheet (see *Bagepalli\_ER Calculations.xls*). The date on which the problem occurred and the problem was fixed is recorded in the village level monitoring sheets and then entered into the online monitoring solution, which is the basis for emission reduction calculations for only the operational days of installed units. The various reasons and days lost due to repairs and maintenance are as follows:

Reason For Breakdown/ Non-Usage	Non-operational biogas days <sup>4</sup> for the monitoring period (1 <sup>st</sup> August 2009-31 <sup>st</sup> July 2011)
Repair Stove	25,044
Nozzle Repair/Replacement	3,827
Repair Inlet Tank	1,794
Repair/Replace Gas Pipe	96,501
Replace Stove	2,229
Tank Repair	4,749
Rain water	5,916
Empty and Replaster Dome	115,274
Unit Demolished	41,704
Watery Gobar	1,074
No Gobar	81,076
Biogas Under Repair	201,862
Didn't Cook	6,279
Not in Village/Kitchen Not Used	20,028
Don't Know	4,298
<b>Total</b>	<b>611,655</b>

The various reasons for non-usage of biogas units are: various unit parts such as stove/stove parts, nozzle, gas pipe was under repair or needed replacement, repair of dome/inlet/outlet tank, the unit was demolished and rebuilt, watery dung to produce enough biogas, kitchen not used/did not cook, etc. When the users were not aware of the actual reason of non-function, it was recorded as such, later the problem identified, and repaired. The units were repaired as soon as it is informed to the case workers.

<sup>4</sup> This is the total number of days in a month all the biogas units under repair were not operational. Thus for a month of 30 days, the total biogas days are 5,485 x 30 days = 164,550

**B.2. Post registration changes****B.2.1. Temporary deviations from registered monitoring plan or applied methodology**

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There are no temporary deviations from registered monitoring plan or applied methodology.

**B.2.2. Corrections**

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There are no corrections to the project information or parameters fixed at validation.

**B.2.3. Permanent changes from registered monitoring plan or applied methodology**

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There are permanent changes from the registered monitoring plan, which was approved by EB. The changes to monitoring plan and the revised PDD were approved prior to the submission of this monitoring report for request for issuance. The approval date of revised monitoring plan is 27<sup>th</sup> September 2012 and reference number is PRC-0121-001. The approved revised PDD with revised monitoring plan is Version 3 of PDD dated 22<sup>nd</sup> August 2012.

**B.2.4. Changes to project design of registered project activity**

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There are no changes to the project design of the project activity.

**B.2.5. Changes to start date of crediting period**

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Crediting Period: From 1<sup>st</sup> September 2006 to 31<sup>st</sup> August 2013

Choice of Crediting Period: Renewable

The earlier crediting period of 18<sup>th</sup> December 2005 – 17<sup>th</sup> December 2012 was changed to the above crediting period.

**B.2.6. Types of changes specific to afforestation or reforestation project activity**

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Not Applicable for this project activity.

**SECTION C. Description of monitoring system**

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This section describes the monitoring system followed stepwise for each of the parameters. This includes data collection procedures which includes data generation, aggregation, recording, calculation and reporting.

The organizational structure, roles and responsibilities of personnel, and emergency procedures for the monitoring system is also described in the following sections.

A CDM Team from Fair Climate Network (FCN) and ADATS has been formed for monitoring and verification of all the monitoring parameters. Qualified and trained people monitor the parameters and calculate the emission reductions.

**C.1. Organization structure**

The biogas project involves implementation of the technology, maintenance and monitoring the emission reduction (ER). All the tasks and activities are carried out in 16 designated “Areas” comprising of 336 villages. Each Area Team consists of a Field Worker, Case Worker and Mahila Trainers (The organization

chart of ADATS can be seen at <http://www.adats.com/misc/Organogram.pdf>). Each Area Team was “in-charge” of the processes in their respective villages. The Area Team transfers as much as this charge to the village level cadre of the Coolie Sangha – i.e. elected Cluster Secretaries, elected Representatives, Village Health Workers and Balakendra Teachers<sup>5</sup>. Such a “transfer of ownership” was markedly visible in the actual selection of participating families and assisting individual families in the actual construction activities. Village level Coolie Sangha Units (CSUs), and especially the Mahila Meetings (Women’s meeting), played a vital role in selecting appropriate sites for the actual construction and pitch in with manual labour to help dig pits. This had led to a second “transfer of ownership”. Village CSUs, in turn, made the participating families the true owners of all the processes affecting the final output. Similarly, it was family labour that voluntarily assisted the skilled masons during actual construction. The women were taught efficient ways of cooking in the Mahila Meetings.

ADATS trained 123 local Masons in the tried and tested construction techniques of biogas plants. Extensive personal information was collected on each Biogas Mason and entered into the computerized database. These provide irrefutable identification and responsibility for each Biogas Unit fixed to a particular Mason.

Monitoring of the parameters mentioned below was conducted jointly by ADATS, FCN, village level Coolie Sangha members’ in-charge and selected biogas users.

## **C.2. Monitoring and Data Collection Procedures**

### ***C.2.1. Monitoring during pre-commission and commission of biogas units***

The construction of biogas plants was done in a phased manner. During the first monitoring period, 4,399 units were commissioned. During the second monitoring period, 1,086 units were commissioned and as on 1<sup>st</sup> August 2009, 5485 were commissioned and are functional. The various processes involved in the implementation of the technology as shown below were monitored for all the units which were commissioned.

1. Selection of participating families
2. Defining Masons
3. Defining Material Suppliers
4. Monitoring Construction Progress
  - Marking
  - Excavation
  - Supplying crushed stone Jelly
  - Supplying Sand
  - Supplying Bricks
  - Supplying Cement
  - Supplying Hardware
  - Concreting
  - Brick work
  - Plastering
  - Filling Gobar (Dung)
  - Supplying Stove
  - Fixing Pipe & Stove
  - Fixing Safety Grill
5. Commissioning
6. Generating End User Agreements

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<sup>5</sup> Teachers working at village level who impart informal education to the children.

These processes were monitored on a day to day basis and database maintained from its initiation to completion dates for each of the biogas unit. Quality Control Supervisors comprising of the Audit team and the case worker of ADATS, the key persons to conduct the overall supervision of installed plants, checked the quality of installed biogas plants to ensure that the required materials were used for the construction of biogas units. All payments for construction of biogas units were made by cheque and suppliers were identified with personal data and digital photographs fed into the computerized databank for verification.

Statutory reports, including Trial Balance, Receipts & Payments statement, Income & Expenditure statement and Balance Sheet, are generated for the project activity. The books of accounts are audited by a certified Chartered Accountant. This financial accounting system gives proof of the construction of these biogas plants under the CDM project activity. Each of the biogas unit has been marked as “ADATS-VELCAN” and the date of construction on the doom, which makes it distinct. The Unit ID numbers are also marked on the biogas units. These evidences validate the construction and commission of the 5,485 biogas plants built in the project area, 4,399 during 2006-07 and another 1086 subsequently during the second monitoring period.

The list of biogas users are identified by a User ID, the name of the beneficiary, the CSU membership number, the village and taluk, and other details such as family strength, land holding, caste, etc. (See *Bagepalli\_ER\_Calculations.xls* for details). Other information includes the start date of construction and the date of commissioning.

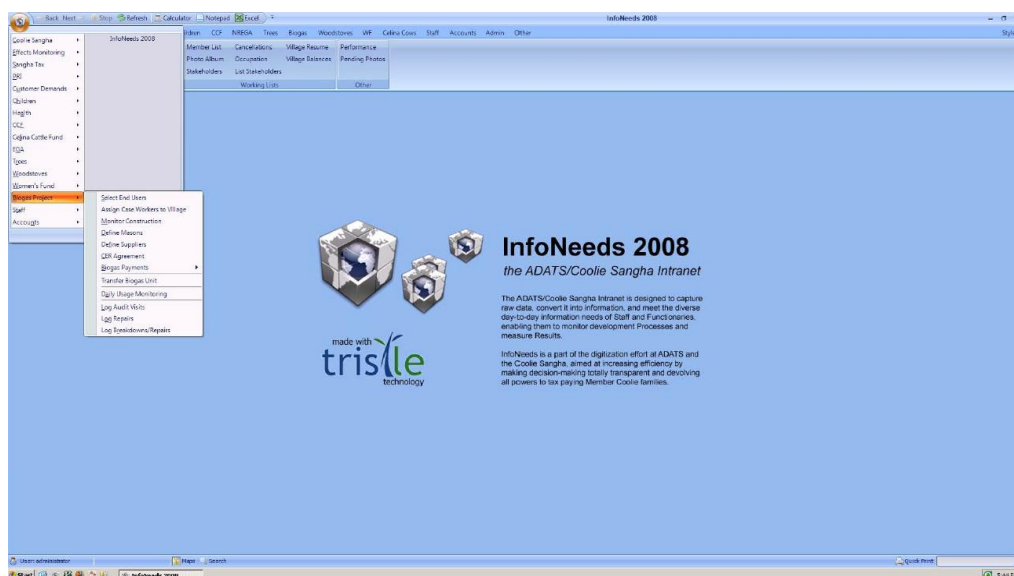
All activity processes, including financial transactions for construction of biogas units, were digitally monitored using an online intranet solution that is integrated into ADATS’s intranet based monitoring system InfoNeeds that tracks various Coolie Sangha activities. Open and transparent online reports are used by everyone – ADATS Staff, Coolie Sangha functionaries and all other secondary stakeholders to know exactly where they stand in terms of progress and results. Reports are generated at all levels i.e. Project, Taluk, Area, Cluster, Village and individual Family level. The database is updated on a daily basis, as and when Field Staff return from their respective villages.

The information on the daily operating units and the operational time is gathered by the village health worker or Balakendra teacher from its users on a day to day basis or during the weekly Mahila meetings<sup>6</sup> held in every village. The information is updated to the individual biogas user’s monitoring database maintained by ADATS by the case worker on monthly basis. The average operational hours for each of the biogas users have been computed based on the daily operational hours. The Treasurer of the Coolie Sangha has been entrusted with the task of audit.

An upfront CER amount is used to maintain the biogas units and keep them in good condition, which is a vital prerequisite for Coolie women to generate CERs and continue enjoying smoke-free cooking. All activity processes, including financial transactions for construction of biogas units, are digitally monitored using an online intranet solution that is integrated into intranet based monitoring system InfoNeeds that tracks various tasks that is under this project.

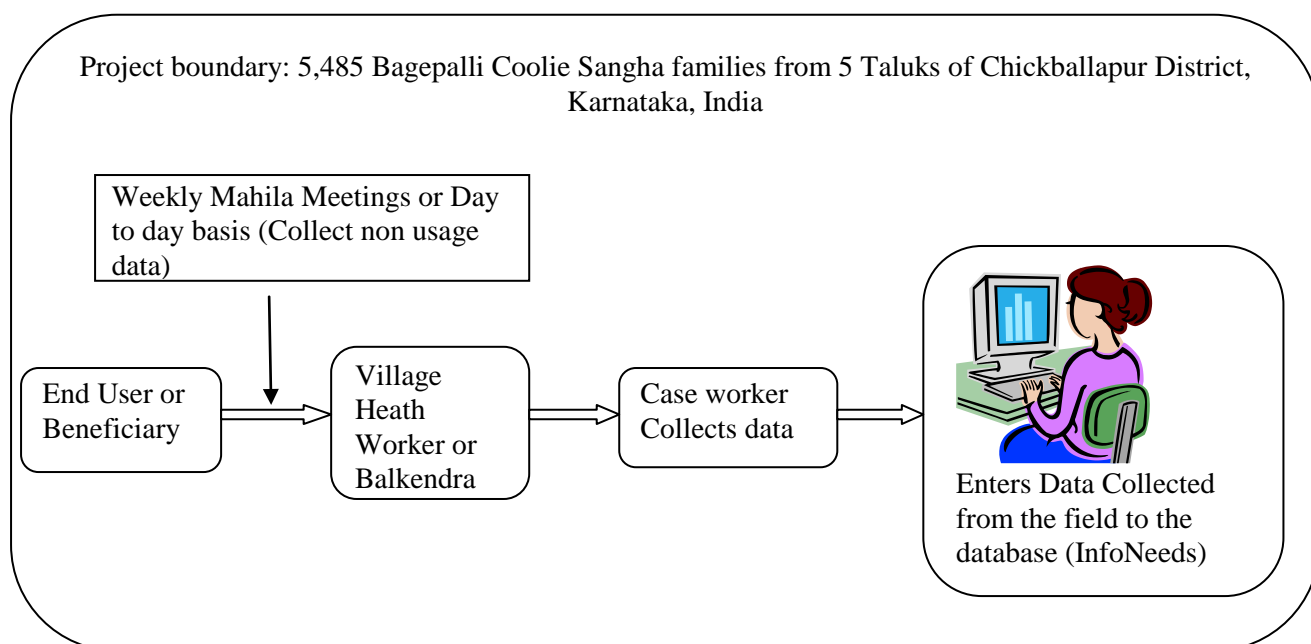
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<sup>6</sup> These Mahila meetings have been held regularly since many years to discuss all issues of coolie sangha



Open and transparent online reports are used by everyone – Staff and all other secondary stakeholders to know exactly their progress and results. Reports are generated at all levels i.e. Project, Taluk, Area, Cluster, Village and individual Family level. The database is updated regularly as and when Field Staff return from their respective villages.

**C2.2 Non-Usage Days:** After commission of biogas plants, the staffs also log-in the repairs required and the dates from when the units were not operational. The day the unit is attended of the problem, the person attending to it and date is logged-in. These in between days are the non-operational days for the units. The information on biogas non-usage days are recorded either by the Balakendra or Village Health worker from its users on a day to day basis or during the weekly Mahila meetings<sup>7</sup> held in every village. The information is updated to the individual biogas user's data base InfoNeeds by the case worker on regular basis. The end users also communicate through mobile phones to the Balakendra or Village Health workers. Thus there is a continuous database maintained of all the biogas units.



<sup>7</sup> These Mahila meetings have been held regularly since many years to discuss all issues of coolie sangha

The above diagram describes the arrangement of monitoring the project activity and how the monitored data flows from end user to the system database.

## SECTION D. Data and parameters

### D.1. Data and parameters fixed ex ante or at renewal of crediting period

<b>Data/Parameter</b>	<b>Baseline emission per household/year</b>
<b>Unit</b>	tCO <sub>2</sub>
<b>Description</b>	Baseline emissions per household with a 2 cum biogas system that replaces fuel wood and kerosene in the baseline
<b>Source of data</b>	Registered PDD
<b>Value(s) applied</b>	3.56
<b>Purpose of data</b>	Calculations of baseline emissions. To estimate emission reductions per household/year. This is based on baseline calculations and fixed throughout the crediting period
<b>Additional comment</b>	As described in the PDD, the emission reduction is calculated using a ratio of 3.56 tCO <sub>2</sub> /unit operating/year.

### D.2. Data and parameters monitored

Based on the approved revised monitoring plan, the parameters monitored are as follows:

ID	Data type	Data variable	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/paper)	For how long is archived data to be kept?	Comment
1	Number of installed 2 m <sup>3</sup> systems	IS	Units	m	Daily basis	All	e & p	Crediting period plus 2 years	ERs will be calculated only for installed units
2	Number of operating 2 m <sup>3</sup> systems	OS	Units	m	Daily basis	All	e & p	Crediting period plus 2 years	Non usage days will be recorded on daily basis and ERs not calculated for non-operational days
3	2 m <sup>3</sup> system average annual operating time	T	Hours	e	Annually	Random sample	e & p	Crediting period plus 2 years	Not used for calculation of the emission reductions
4	Non-usage days of installed and operational biogas plants		Days	m	Daily basis	All	e & p	Crediting period plus 2 years	ERs will be deducted for non-operational days.



<b>Data/Parameter</b>	<b>Number of installed 2 m<sup>3</sup> systems</b>
<b>Unit</b>	Number
<b>Description</b>	Number of biogas units installed under the project activity
<b>Measured/Calculated/Default</b>	Measured
<b>Source of data</b>	Field Data monitored on a daily basis which was entered into the ADATS monitoring solution - InfoNeeds.
<b>Value(s) of monitored parameter</b>	5,485 as on 1 <sup>st</sup> August 2009
<b>Monitoring equipment</b>	There are no monitoring equipments to measure this parameter. The method to monitor the number of biogas units installed is described in Section C. Construction processes were monitored on a day to day basis and database maintained from its initiation to completion for each of the biogas units.
<b>Measuring/Reading/Recording frequency</b>	The construction processes was monitored on a day to day basis from pre-commission till commissioning for all the 5,485 biogas units.
<b>Calculation method (if applicable)</b>	Not applicable
<b>QA/QC procedures</b>	After commissioning and satisfactory functioning of the biogas plant for a minimum of 2 weeks, an end user agreement was signed with the beneficiary, which is taken as the day of commissioning of the biogas plant. All activity processes, including financial transactions for construction of biogas units were digitally monitored using the online intranet solution that is integrated into ADATS's intranet based monitoring system InfoNeeds. This provides verification for the construction of biogas units.
<b>Purpose of data</b>	Used to calculate the emission reductions of the project activity.
<b>Additional comment</b>	Emission Reductions are calculated for only the installed and operational biogas units.



<b>Data/Parameter</b>	<b>Number of operating 2 m<sup>3</sup> systems</b>
<b>Unit</b>	Number
<b>Description</b>	Number of biogas operating systems under the project activity
<b>Measured/Calculated/Default</b>	Measured
<b>Source of data</b>	Field Data monitored on a daily basis which is entered into the ADATS online monitoring solution, InfoNeeds.
<b>Value(s) of monitored parameter</b>	5,485
<b>Monitoring equipment</b>	There are no monitoring equipments to measure this parameter. The method to monitor the number of operating systems is described in Section C. The non-operational days of all the installed units needs to be monitored to record the number of units operational in a year on a daily basis. During this monitoring period, the biogas systems were monitored on a day to day for non-operational days and annual usage hours by the Balakendra Teachers or the health workers at village level, which was entered into the ADATS database – InfoNeeds for all the biogas units.
<b>Measuring/Reading/Recording frequency</b>	The number of non-operating systems was done on a day to day basis for all the installed 5,485 biogas units.
<b>Calculation method (if applicable)</b>	For a particular day, the number of operating systems is all the units which were functional. The number of operational days during the monitoring period for each of the system was determined to estimate the emission reductions.
<b>QA/QC procedures</b>	For efficient monitoring, continuous day to day monitoring was done. A user friendly survey sheet for each of the biogas user was maintained at the village level by the village health worker or the Bal Kendra Teacher. Hence continuous monitoring of the operational units was done.
<b>Purpose of data</b>	To calculate emission reductions.
<b>Additional comment</b>	Emission Reductions were deducted or not calculated for non-functional days of the units.



<b>Data/Parameter</b>	2 m <sup>3</sup> system average annual operating time
<b>Unit</b>	Hours
<b>Description</b>	Hours of operation of biogas units/day
<b>Measured/Calculated/Default</b>	Measured
<b>Source of data</b>	Field data monitored on a daily basis which is entered into the ADATS online monitoring solution, InfoNeeds.
<b>Value(s) of monitored parameter</b>	2.66 hours/day
<b>Monitoring equipment</b>	There are no monitoring equipments to measure this parameter. The method to monitor the annual operating time of biogas system is described in Section C. The operating time of biogas systems was monitored on a day to day basis by the Balakendra Teachers or the health workers at village level, which is entered into the ADATS database – InfoNeeds for all the biogas units. This data was monitored continuously before the revised monitoring plan was submitted and approved. Hence the data presented here is on a daily basis.
<b>Measuring/Reading/Recording frequency</b>	It was monitored on a day to day basis by the Balakendra Teachers or the health workers at village level, which was entered into the ADATS database – InfoNeeds for all the biogas units. This parameter was measured along with usage/non-usage of biogas units. Thus, data was monitored continuously before the revised monitoring plan was approved. Hence the data presented here is on a daily basis.
<b>Calculation method (if applicable)</b>	Average hours of usage of all the households for all the days in use during the monitoring period.
<b>QA/QC procedures</b>	<p>As per the revised PDD, the average operating hours need to be monitored only once a year on a random basis. Continuous day to day monitoring was being done before the submission and approval of revised monitoring plan. A user friendly survey sheet for each of the biogas user is maintained at the village level by the village health worker or the Bal Kendra Teacher, which was entered into the monitoring database. Hence continuous monitoring of the operational units was done.</p> <p>A revised monitoring plan was submitted and approved on 27/September/2012 by the EB. In the revised monitoring plan, the operational hours needs to be monitored yearly once for randomly selected households. But during this period of monitoring it was done for all the days for all the units.</p>
<b>Purpose of data</b>	The value is not be used for ER calculations.
<b>Additional comment</b>	It is part of monitoring requirements under I.C



<b>Data/Parameter</b>	Non-usage days of installed and operational biogas plants																																														
<b>Unit</b>	Number of days																																														
<b>Description</b>	Based on the number of days some of the biogas units did not function due to: repairs, family not in the village or dung not fed into the digester.																																														
<b>Measured/Calculated/Default</b>	Measured																																														
<b>Source of data</b>	Field Data recorded																																														
<b>Value(s) of monitored parameter</b>	<p>The domestic biogas units are in continuous operation after installation. In between, due to repair and maintenance, some of the biogas units were not be in operation. The days not operational is recorded for each of the unit. This information is included in the excel ER calculations sheet (see <i>Bagepalli_ER Calculations.xls</i>). The non-usage days was recording along with operational hours for usage days during this monitoring period on a day to day basis. The data was entered into the online monitoring solution, which is the basis for emission reduction calculations of operational days of the installed units. The biogas days lost due to repairs and maintenance are as follows:</p> <table border="1"> <thead> <tr> <th><b>Month</b></th> <th><b>Total Number of biogas days<sup>8</sup> the units were not used for which ERs were not calculated</b></th> </tr> </thead> <tbody> <tr><td>Aug-09</td><td>1,787</td></tr> <tr><td>Sep-09</td><td>1,736</td></tr> <tr><td>Oct-09</td><td>1,590</td></tr> <tr><td>Nov-09</td><td>1,594</td></tr> <tr><td>Dec-09</td><td>1,269</td></tr> <tr><td>Jan-10</td><td>1,595</td></tr> <tr><td>Feb-10</td><td>6,113</td></tr> <tr><td>Mar-10</td><td>8,254</td></tr> <tr><td>Apr-10</td><td>8,904</td></tr> <tr><td>May-10</td><td>10,431</td></tr> <tr><td>Jun-10</td><td>12,567</td></tr> <tr><td>Jul-10</td><td>11,042</td></tr> <tr><td>Aug-10</td><td>13,626</td></tr> <tr><td>Sep-10</td><td>48,796</td></tr> <tr><td>Oct-10</td><td>51,465</td></tr> <tr><td>Nov-10</td><td>32,939</td></tr> <tr><td>Dec-10</td><td>35,233</td></tr> <tr><td>Jan-11</td><td>36,361</td></tr> <tr><td>Feb-11</td><td>56,233</td></tr> <tr><td>Mar-11</td><td>60,337</td></tr> <tr><td>Apr-11</td><td>56,174</td></tr> <tr><td>May-11</td><td>56,597</td></tr> </tbody> </table>	<b>Month</b>	<b>Total Number of biogas days<sup>8</sup> the units were not used for which ERs were not calculated</b>	Aug-09	1,787	Sep-09	1,736	Oct-09	1,590	Nov-09	1,594	Dec-09	1,269	Jan-10	1,595	Feb-10	6,113	Mar-10	8,254	Apr-10	8,904	May-10	10,431	Jun-10	12,567	Jul-10	11,042	Aug-10	13,626	Sep-10	48,796	Oct-10	51,465	Nov-10	32,939	Dec-10	35,233	Jan-11	36,361	Feb-11	56,233	Mar-11	60,337	Apr-11	56,174	May-11	56,597
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<sup>8</sup> This is the total number of days in a month all the biogas units under repair were not operational. Thus for a month of 30 days, the total biogas days are 5,485 x 30 days = 164,550

	<table border="1"> <tr> <td>Jun-11</td> <td>49,961</td> </tr> <tr> <td>Jul-11</td> <td>47,051</td> </tr> <tr> <td><b>Total</b></td> <td><b>611,655</b></td> </tr> </table>	Jun-11	49,961	Jul-11	47,051	<b>Total</b>	<b>611,655</b>
	Jun-11	49,961					
	Jul-11	47,051					
<b>Total</b>	<b>611,655</b>						
	The various reasons for non-usage of biogas units are non availability of dung, did not cook at home, biogas stove under repair, nozzle not working, unit demolished and rebuilt, biogas tank under repair, the stove needs to be replaced, watery dung, etc.						
<b>Monitoring equipment</b>	There are no monitoring equipments to measure this parameter.						
<b>Measuring/Reading/Recording frequency</b>	It was monitored on a day to day basis by the Balakendra Teachers or the health workers at village level, which is entered into the ADATS database – InfoNeeds for all the biogas units.						
<b>Calculation method (if applicable)</b>	The operational days in a year for a biogas unit are 365 days minus non-operational days.						
<b>QA/QC procedures</b>	As per the methodology, the number of non-operational days of biogas units need not be measured. To be conservative and reduce uncertainty, the ERs are deducted for the days each of the commissioned biogas unit is not functional.						
<b>Purpose of data</b>	To calculate emission reductions for only the operational days for each biogas unit.						
<b>Additional comment</b>	This information is included in the excel ER calculations sheet (see <i>Bagepalli_ER Calculations.xls</i> ).						

### D.3. Implementation of sampling plan

#### D.3.1. Description of implemented sampling design

All the monitoring parameters i.e. (i) Number of installed 2 m<sup>3</sup> systems (ii) Number of operating 2 m<sup>3</sup> systems (iii) 2 m<sup>3</sup> system average annual operating time and (iv) Non-usage days of installed and operational biogas plants were monitored on a day to day basis for all the installed units for the monitoring period. There was no sampling plan as 100% units were monitored for all the parameters.

Based on the revised monitoring plan, the 2 m<sup>3</sup> system average annual operating time can be determined based on sample survey. The operational time was also monitored along with operational/non-operational details of biogas units on a day to day basis before the submission and approval of revised monitoring plan.

Thus, no sample surveys were conducted for the project activity during this monitoring period, which has higher precision and lesser uncertainty.

#### D.3.2. Collected data

All the monitoring parameters i.e. (i) Number of installed 2 m<sup>3</sup> systems (ii) Number of operating 2 m<sup>3</sup> systems (iii) 2 m<sup>3</sup> system average annual operating time and (iv) Non-usage days of installed and operational biogas plants were monitored on a day to day basis and data collected for all the installed units. The data collected was entered into the monitoring solution.

#### D.3.3. Analysis of the collected data

The data collected was entered into monitoring solution was exported to excel sheet for data analysis and to calculate the emission reductions of the project activity (*Bagepalli\_ER Calculations.xls*).

(i) *Number of installed 2 m<sup>3</sup> systems:* Of the 5,500 units that were to be constructed under the project, 5,485 units were constructed. All the units were constructed during the first and second monitoring period, before August 2009. No units were constructed during this monitoring period.

(ii) *Number of operating 2 m<sup>3</sup> systems:* The analysis of all the operating systems for each day consolidated for each month is shown in *Bagepalli\_ER Calculations.xls*. The emission reductions are calculated only of units for operational days.

(iii) *2 m<sup>3</sup> system average annual operating time:* Based on the data collected, the average operating time of a biogas unit for the monitoring period is 2.66 hours/unit/day.

(iv) *Non-usage days of installed and operational biogas plants:* The non-usage days or non-operating units were monitored on a day to day basis for all the constructed units. Based on the data, which is collected and entered into the online monitoring system, there were repairs, overhaul and maintenance of constructed biogas units. The reasons for the breakdown and total non-operational biogas days for the monitoring period (1<sup>st</sup> August 2009-July 2011) are as follows:

<b>Reason For Breakdown/ Non-Usage</b>	<b>Non-operational biogas days for the monitoring period (1<sup>st</sup> August 2009-31<sup>st</sup> July 2011)</b>
Repair Stove	25,044
Nozzle Repair/Replacement	3,827
Repair Inlet Tank	1,794
Repair/Replace Gas Pipe	96,501
Replace Stove	2,229
Tank Repair	4,749
Rain water	5,916
Empty and Replaster Dome	115,274
Unit Demolished	41,704
Watery Gobar	1,074
No Gobar	81,076
Biogas Under Repair	201,862
Didn't Cook	6,279
Not in Village/Kitchen Not Used	20,028
Don't Know	4,298
<b>Total</b>	<b>611,655</b>

A detailed breakdown time for each of the biogas unit is shown in excel sheet (*Bagepalli\_ER Calculations.xls*).

There have been no events or situations that occurred during this monitoring period which has impacted the applicability of the methodology.

#### **D.3.4. Demonstration on whether the required confidence/precision has been met**

All the parameters were monitored for all the installed units. Thus there results of the data has very high confidence and precision level, with very low uncertainly levels.

**SECTION E. Calculation of emission reductions or GHG removals by sinks****E.1. Calculation of baseline emissions or baseline net GHG removals by sinks**

&gt;&gt;

As described in the PDD and in the revised monitoring plan, the emission reduction was calculated using a ratio of 3.56 tCO<sub>2</sub>/unit operating/year. The emission reduction for a year is calculated as follows:

$$ER_y = \sum_{n=1}^{5500} (OS_y \times \frac{EM_y}{365} \times \text{number.of.operational.days})$$

where:

ER<sub>y</sub> : yearly Emission Reductions (tCO<sub>2</sub>)OS<sub>y</sub> : 2 m<sup>3</sup> operating system in year y.

EM<sub>y</sub> = 3.56 t CO<sub>2</sub>e = Baseline emissions per household with a 2 m<sup>3</sup> biogas system. Calculated as the average yearly wood consumption times the emission coefficient for (non-renewable) wood, plus average yearly kerosene consumption times the emission coefficient for kerosene.

Number of Operational days = 365 - Non-usage days of installed biogas.

The total emission reductions for the period 1<sup>st</sup> August 2009 to 31<sup>st</sup> July 2011 for the installed and operational 5,485 biogas units are **33,087 tCO<sub>2</sub>e**. The unit-wise calculations of emission reduction are as enclosed in the excel sheet – *Bagepalli\_ER Calculations.xls*.

**The total emission reductions for the period 1<sup>st</sup> August 2009 to 31<sup>st</sup> July 2011 for the installed 5,845 biogas units are 33,087 tCO<sub>2</sub>e.**

**E.2. Calculation of project emissions or actual net GHG removals by sinks**

&gt;&gt;

There are no project emissions in the project activity.

**E.3. Calculation of leakage**

&gt;&gt;

There is no leakage due to the project activity. As mentioned in the PDD, leakage is not an issue and need not be monitored for the project activity.

**E.4. Summary of calculation of emission reductions or net anthropogenic GHG removals by sinks**

Time Period	Baseline emissions or baseline net GHG removals by sinks (tCO <sub>2</sub> e)	Project emissions or actual net GHG removals by sinks (tCO <sub>2</sub> e)	Leakage (tCO <sub>2</sub> e)	Emission reductions or net anthropogenic GHG removals by sinks (tCO <sub>2</sub> e)
1 <sup>st</sup> Aug 2009 to 31 <sup>st</sup> July 2011	33,087	0	0	33,087
<b>Total</b>	<b>33,087</b>	<b>0</b>	<b>0</b>	<b>33,087</b>



### E.5. Comparison of actual emission reductions or net anthropogenic GHG removals by sinks with estimates in registered PDD

Item	Values estimated in ex-ante calculation of registered PDD	Actual values achieved during this monitoring period
Emission reductions or GHG removals by sinks (tCO <sub>2</sub> e) for the monitoring period (1-Aug-2009 to 31-July-2011) (tCO <sub>2</sub> )	39,106	33,087

### E.6. Remarks on difference from estimated value in registered PDD

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The emission reductions are lesser than that projected in the PDD as only 5,485 are commissioned. Also, as detailed in section D.2, many units were under repair and maintenance leading to 544,626 non-operational biogas days during the 2 years of monitoring period. This has led to a decrease of 15.39% of expected emission reductions for the monitoring period.

These factors has accounted for lesser emission reductions to that estimated in the registered PDD.

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#### History of the document

Version	Date	Nature of revision
02.0	EB 66 13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01	EB 54, Annex 34 28 May 2010	Initial adoption.
<b>Decision Class:</b> Regulatory <b>Document Type:</b> Form <b>Business Function:</b> Issuance		