

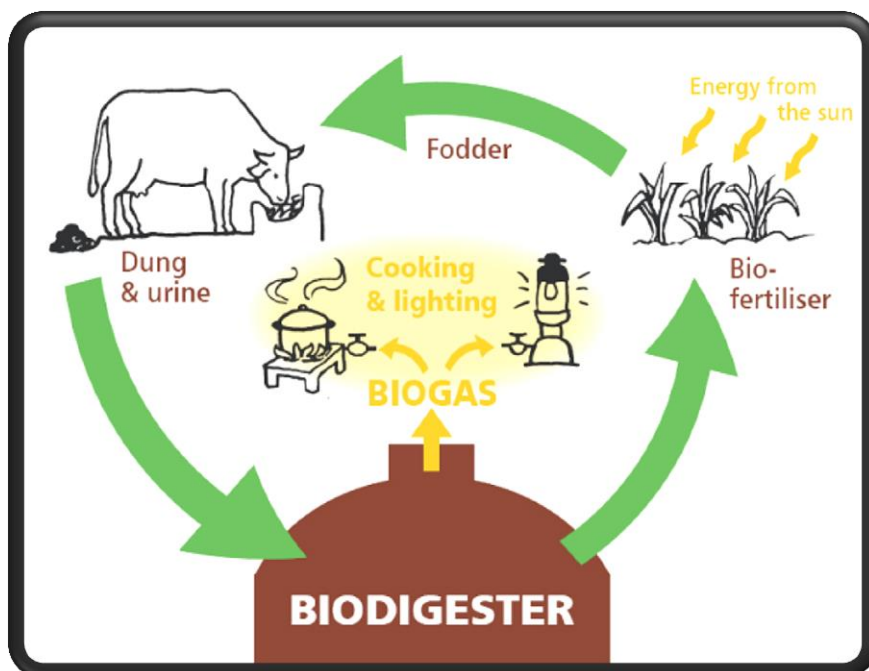
GS-849: SEDS Biogas CDM Project for Rural Poor

CDM Reference No: 3541; GS Project ID: GS 849

Monitoring Period – II, Version: 02

Dated: 30th June 2015

Monitoring Period: 1st January 2013 – 30th April 2014 (Both days included)



Report by: Fair Climate Network (FCN)

Project Summary

The carbon offset Gold Standard CDM project “SEDS Biogas CDM Project for Rural Poor” is being implemented by the NGO, Social Education and Development Society (SEDS). The project is installation of domestic biogas plants in 5,000 rural households in Anantapur District of Andhra Pradesh State, India. The biogas installations are fed with animal dung and kitchen waste. The generated gas is then mainly used for cooking and water heating. In addition, the slurry of the remaining manure serves as high quality fertiliser replacing chemical products.

The project is contributing to reduction of greenhouse gas emissions and degradation of forests. This project is contributing to sustainable development of poor communities in the project region. In addition, people are profiting from (i) monetary benefits (ii) reduction in drudgery of fuel wood collection, (iii) employment opportunities and (iv) are being rid of indoor air pollution. The project is helping to reduce CO₂ while improving the quality of life of the beneficiary households in terms of health and socio economic status in Anantapur district.

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1. Project Description

The Social Education and Development Society (SEDS), was founded in 1980 by Rajen Joshua and Manil Jayasena as a grassroots development NGO, motivated by the desire to help the poorest of the poor in the drought-prone area of Anantapur District in Andhra Pradesh. As Anantapur is the second most drought prone area in India and much of its natural resources are depleted, it soon became clear that environmental problems would have to be tackled first, if peoples' livelihoods were to be made sustainable. To tackle such problems SEDS, under CDM regime undertook a Biogas project in 5 Mandals of Anantapur District.

The purpose of this biogas CDM Project activity is to set up 5,000 biogas plants (digesters) of 2 m³ capacity each for single households in 5 Mandals of Anantapur District. Each household has installed a 2 m³ biogas plant and feed cattle dung into the anaerobic digester for the production of biogas for cooking purpose and heating of hot water. The aim of the project is to replace the commonly used inefficient wood fired mud stoves technology, with clean, sustainable and efficient biogas and in this way replace non-renewable biomass with biogas for cooking and hot water heating. In the project activity, the biogas units are fed with dung substrate to produce energy for cooking and heating water.



This is replacing non-renewable biomass in traditional cook stoves in the baseline, thus reducing greenhouse gas emissions.

The project was registered as a CDM project on 09th September 2010 and as a GS project on 15th February 2012 as a normal GS project. The start date of the GS monitoring report is the same as the CER monitoring report i.e. 1st January 2011. Till 30th April 2014, 3014 units have been commissioned and 828 are under construction. The first issuance for the project activity was as follows:

Summary of the Project Activity and ERs Generated in First Monitoring Period	
First monitoring period	1 st January 2011 to 31 st December 2012
ERs generated for the period 1st January 2011 to 31st December 2012	6,043 tCO ₂

Table 1: Summary of First Monitoring Period

This is the second GS Sustainable Indicators monitoring report that corresponds to the period from 1st January 2013 to 30th April 2014 (inclusive of both days). The details of the project activity are as follows:

UNFCCC Reference Number	3541
Gold Standard Registration Number	GS 849
Monitoring Report Number	II
Second Monitoring Period	1 st January 2013 to 30 th April 2014
Emission Reduction/Unit/Year	3.25
Biogas Units commissioned till 30 th April 2014	3014
ERs generated for the period 1 st January 2013 to 30 th April 2014 (after subtracting for non-operational days)	9,932 tCO ₂

Table 2: Summary of the Project Activity and ERs Generated for this Monitoring Period

Further vintage-wise emission reductions for the monitoring period is as follows:

Year	Emission Reductions (tCO ₂)
2013	7,503
2014	2,429
Total	9,932

2. Objective of this Report

The aim of this report is to evaluate the parameters of Sustainable development Indicators which were considered positive parameters at the beginning of the project. The objective is to assess the impacts of the CDM project activity on biogas beneficiaries involved in this project its contribution to sustainable development.

To achieve the aforementioned objective, a sample survey was conducted in the project area, with definite (a) sampling design (b) data to be collected during the survey and (c) implementation plan, based on the guidelines of the Executive Board (EB) of the UNFCCC, Annex 06, EB67, "Guidelines for sampling and surveys for CDM project activities and programme of activities". The report includes the sampling plan, with description of sampling approach and justification of selection of chosen approach.

3. Sustainable Development Matrix

The sustainable development matrix developed for the project activity as given in the registered passport is as follows:

Indicator	Mitigation Measure	Relevance to achieving MDG	Chosen parameter and explanation	Preliminary Score
Air Quality	No mitigation measures required	MGD No.7 -Reduction in indoor air pollution -Improvement in health of women	- No. of biogas units constructed and operating - Reduction in incidence of health problems due to better indoor air quality	+
Water quality and quantity	No mitigation measures required	- Lesser quantity of water would be required compared to baseline as there is no	- No impact	o

		soot on the vessels. But water would now be required for preparing the dung substrate for biogas. Thus there in no net impact.		
Soil condition	No mitigation measures required	-Application of slurry to the fields -Decrease in use of chemical fertilizer It would be difficult to analyse the status of NPK is soil influenced by application of slurry or dung.	In view of the fact that the status of NPK in soil is influenced by many factors including application of slurry or dung, the laboratory test and evaluation may not prove the impact on the chosen parameter. Thus the parameter has been excluded from the sustainability assessment.	o
Other pollutants	No mitigation measures required	- Decrease in pathogens due to conversion of dung to slurry	- Quantity of pathogens in slurry compared to that of dung	+
Biodiversity	No mitigation measures required	-Due to less dependence on fuel wood, there would be better regeneration of trees, shrubs and herbs in the forests and non-forest areas. But it would be very difficult to assess the impact of the project activity alone on biodiversity.	-Though there would be a definite positive impact, it would be difficult to assess quantitatively. Thus this indicator is not considered.	o
Quality of employment	No mitigation measures required	MGD No.1 - Creation of new business venture especially for supply of material to the project activity. - Employment for masons and helpers; - Better quality of work to the local communities. -Involvement of SHG/VO/VHW members in daily	- Improvement in quality of jobs compared to baseline.	+

		monitoring		
Livelihood of the poor	No mitigation measures required	MGD No.3 - Avoidance of drudgery -Convenience to the family -Better social environment at home	-Improvement in living conditions especially of women in the family as perceived by the communities	+
Access to affordable and clean energy services	No mitigation measures required	-Presence, affordability of services and reliability of services of biogas units -Reducing dependence on biomass and kerosene	-No. of biogas units constructed and operating	+
Human and institutional capacity	No mitigation measures required	MGD No. 2 -Empowerment of women and the Village Organisation (VO) members - Children can attend school in time -Increased institutional capacity	-Improvement in human and institutional capacity as perceived by the communities	+
Quantitative employment and income generation	No mitigation measures required	MGD No.1 - Employment generated in the informal sector -Income from CERs	-Income generation at family level due to the project activity, as perceived by the communities. On full time basis 1 CDM coordinator, 1 online database manager and 121 village level volunteers. Temporary jobs include 50 masons to construct biogas units and other operational jobs created during project lifetime.	+
Balance of payments and investment	No mitigation measures required	MGD No.8 -Investment to the project through forward funding of CERs -Decrease in use of kerosene	-Foreign revenue for the project.	+
Technology transfer and technological	No mitigation measures	-Technical and awareness training programs will be	-However, there is no any technology transfer.	o

self-reliance	required	conducted for the communities in proper operation and management of the biogas digester, system as well as correct methods and timing of biogas liquid and residue application in agricultural fields.		
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4. Monitoring Parameters for sustainable development

As described in the registered GS Passport for the project activity, the monitoring parameters for project activity is as follows.

No	1		
Indicator	Air quality		
Mitigation measure	N/A		
Chosen parameter	<ul style="list-style-type: none"> No. of biogas units constructed and operating Reduction in incidence of health problems due to better indoor air quality 		
Current situation of parameter	There are no biogas plants and households mainly use traditional 3 stone mud stove which is inefficient and results in extreme indoor air pollution causing health problems.		
Estimation of baseline situation of parameter	As mentioned in the PDD, the baseline of the project is the usage of fuel wood. As per the survey done in the project area, the annual firewood consumption per appliance is 3.37 t/family/yr with a negligible kerosene usage of 0.93 ltrs/family/yr.		
Future target for parameter	<ul style="list-style-type: none"> Construct 5000 biogas units by 2nd year and eliminate use of firewood. Improve indoor air conditions and reduce respiratory problems especially for women and children. 		
Way of monitoring	How	<ul style="list-style-type: none"> Monitor the number of biogas operating through the digitized monitoring database which will generate real time progress reports. Sample survey and record the experience by the communities for reduction in health problems compared to baselines. 	
	When	Annually	
	By who	SEDS Staff	
No	2		
Indicator	Other pollutants		
Mitigation measure	N/A		
Chosen parameter	Quantity of pathogens in slurry compared to that of dung		
Current situation of parameter	Dung is left in the open which breeds a lot of pathogens		

Estimation of baseline situation of parameter	Will be assessed during periodic testing of dung for load of pathogens	
Future target for parameter	The pathogen load will get reduced in the slurry	
Way of monitoring	How	Laboratory test of pathogen load in slurry and dung
	When	Once in two years
	By who	Certified Laboratory

No	3	
Indicator	Quality of employment.	
Mitigation measure	N/A	
Chosen parameter	Improvement in quality of jobs for the community	
Current situation of parameter	<ul style="list-style-type: none"> • Women spend lot of time in search and collection of firewood. • No such volumes of biogas construction activity in the baseline scenario. 	
Estimation of baseline situation of parameter	<ul style="list-style-type: none"> • Considerable time spent on collection of firewood, cooking food and cleaning vessels. 	
Future target for parameter	<ul style="list-style-type: none"> • Jobs created due to the 5000 biogas project construction and maintenance activity. • Income generation activities promoted due to time saved for women. 	
Way of monitoring	How	<ul style="list-style-type: none"> • Track of wages paid for the biogas project activity through the digitized monitoring database. • Income generation activities taken up by women compared to baseline situation.
	When	<ul style="list-style-type: none"> • Reports generated from digitized monitoring database which is updated on a daily basis. • Annual stratified sample survey
	By who	SEDS Staff.

No	4	
Indicator	Livelihood of the poor	
Mitigation measure	N/A	
Chosen parameter	Improvement in living conditions especially of women in the family as perceived by communities.	
Current situation of parameter	Routine drudgery and burden of firewood gathering, cooking and water heating and washing blackened utensils is relentless life.	
Estimation of baseline situation of parameter	<ul style="list-style-type: none"> • Women and girl children are mainly responsible for preparing and cooking food for the entire family • Long hours for cooking on traditional cookstove and frequent visits for firewood collection, often first thing in the morning. 	
Future target for parameter	<ul style="list-style-type: none"> • Reduce women's domestic cooking workload activities considerably as compared to baseline scenario. • Better social environment at home due to reduced drudgery especially for women. 	
Way of monitoring	How	Parameters will be monitored through a sample survey to

		analyse the cooking time saved and how biogas has benefitted the family compared to baselines.
	When	Annual stratified sample survey
	By who	SEDS Staff

No	5	
Indicator	Access to affordable and clean energy services	
Mitigation measure	No mitigation measure required	
Chosen parameter	No. of biogas units constructed and operating	
Current situation of parameter	Traditional cook stove is used for cooking and hot water bath	
Estimation of baseline situation of parameter	<ul style="list-style-type: none"> • Women are forced to spend much of their time and physical energy to ensure firewood availability for cooking and hot water bath purposes. • Distance for firewood is increasing and is available in scanty. This is resulting in even black market sales of firewood in areas far from forest. 	
Future target for parameter	<ul style="list-style-type: none"> • Construction and functioning of biogas plants under the CDM project activity. • Eliminate dependency on firewood and use biogas as a reliable and easy access for cooking fuel. 	
Way of monitoring	How	Extraction from digitised monitoring system which will be updated on daily basis
	When	During preparation of GS monitoring report from online monitoring system which will be updated on daily basis
	By who	SEDS Staff

No	6	
Indicator	Human and institutional capacity	
Mitigation measure	No mitigation measure required	
Chosen parameter	Improvement in human and institutional capacity as perceived by the communities.	
Current situation of parameter	<ul style="list-style-type: none"> • Drudgery and burden of firewood gathering especially women and girl child. • Cooking, water heating and washing blackened utensils is relentless; all their working life. • Children either get late to school as food is not ready in time or lack time to attend regularly. 	
Estimation of baseline situation of parameter	Large part of the time is spend going to the forests and other lands for fuel wood collection, processing them and storing them for daily use in cooking and hot water bath. Cooking takes a lot of time, especially in the morning resulting in delay of preparing food in time for the children to attend school in time.	
Future target for parameter	<ul style="list-style-type: none"> • Empowerment of women as they have more time now to take up other activities • Children can attend school regularly and in time. 	
Way of monitoring	How	Through documentation of community experience with biogas units as compared to baseline through focused group discussions.

	When	Annually
	By who	SEDS Staff

No	7	
Indicator	Quantitative employment and income generation	
Mitigation measure	No mitigation measure required	
Chosen parameter	Income generation at family level due to the project activity, as perceived by the communities. On full time basis 1 CDM coordinator, 1 online database manager & 121 village level volunteers. Temporary jobs include 50 masons to construct biogas units and other operational jobs created during the project lifetime.	
Current situation of parameter	Fuelwood collection takes majority of the domestic time each day for the women in terms of collection, processing and storing. Apart from that cleaning of blackened vessels is a strenuous task. These activities leave very less time for other activities.	
Estimation of baseline situation of parameter	Time spent on fuelwood procurement, cooking, cleaning vessels and other domestic work leaves minimal scope of time availability for any other social or economic activity.	
Future target for parameter	<ul style="list-style-type: none"> Income and other value added activities taken up by women. Periodical CER income to women as recognition of their efforts for cooking. 	
Way of monitoring	How	Stratified sample survey
	When	Annually
	By who	SEDS Staff

No	8	
Indicator	Balance of payments and investment	
Mitigation measure	No mitigation measure required	
Chosen parameter	<ul style="list-style-type: none"> Access to International funding to build domestic biogas units through carbon investors. Money saved at household level on cooking energy fuels like firewood, kerosene, etc. 	
Current situation of parameter	<ul style="list-style-type: none"> Currently, only minimal government support is available to meet the biogas cost with no access to international funding for such programmes. Kerosene is purchased at subsidised rates and in many places households are forced to purchase firewood due to scarcity. 	
Estimation of baseline situation of parameter	<ul style="list-style-type: none"> Minimal financial support reaches to limited households. There is no 100% investment dedicated energy programme in the project area. Kerosene and firewood dependency encourages black marketing and increases economical burden. 	
Future target for parameter	<ul style="list-style-type: none"> Sale of certified emission reductions (CERs) to access international funding to construct 5000 biogas units. Replacement of baseline cooking energy fuels with 	

		biogas.
Way of monitoring	How	<ul style="list-style-type: none"> • Audited Account Statement for the project activity. • Stratified sample survey.
	When	Annually
	By who	<ul style="list-style-type: none"> • Chartered Accountant • SEDS Staff

5. Monitoring and Sampling Design

The above discussed sustainable development indicator parameters were monitored through following 3 processes:

- i. Sample Survey
- ii. Laboratory Analysis
- iii. Daily monitoring which is entered into digitised Monitoring Database Solution

6.1 Sample Survey

The FCN Technical Team (CDM Consultant) and the SEDS staff conducted a sample survey to assess the project activity on sustainable development. The questionnaire designed, field tested and implemented for the survey during the first monitoring period was employed. A stratified random sampling was conducted in the project area to monitor the following sustainable development parameters:

- ✓ Improvement of health problems due to reduction in smoke and better indoor air quality
 - Community's response to reduction in health problems after use of biogas
- ✓ Generation of quality employment and increase in their income
 - Income generation activities taken up women after the project activity
- ✓ Improvement of livelihood of communities especially of women in the family
 - Reduction of time in collection, processing and storage of fuel wood for cooking and hot water bath
 - Reduced time for cooking
 - Better social environment at home due to reduced drudgery especially for women
- ✓ Human and institutional capacity
 - Empowerment of women as they have more time now to take up other activities
 - Children can attend school in time

The objective of the survey is to obtain unbiased and reliable data of above sustainable development parameters in order to assess the impact of project activity as discussed in the registered GS passport.

5.1.1 Reliability Requirement

Sample survey was conducted to determine the various parameters as stated above. Determination of sample size is in accordance with Annex 06, EB 67, "Guidelines for sampling and surveys for CDM project activities and programme of activities" which specifies the reliability requirements and describes appropriate sampling methods applicable to small-scale

projects. For developing a sampling plan, the sample size needs to be determined to achieve a required level of reliability. The sample size was determined to obtain 90/10 confidence/precision levels.

5.1.2 Sampling Frame

The Sampling frame is the complete listing of all the rural households for which biogas was built under the project activity in Penukonda, Roddam, Somandepalli, Gorantla and Chilamathur Mandals of Ananthpur District, Andhra Pradesh. Each of the household has a unique identification number with all the required details of the family, which makes it simple and easy to select sample households.

5.1.3 Target Population

The target population is 3,014 rural households for which biogas were constructed in 5 Mandals of Anantapur district.

Mandal	Total Biogas Units
Chillamathur	434
Gorantla	546
Penukonda	255
Roddam	1,110
Somandepalli	669
Total	3,014

Table 3: Target Population

5.1.4 Sampling Method

Household level questionnaire method was employed to conduct the survey and collect information. The questionnaire adopted for the survey is included in Annex 1. The questionnaire was composed on various sections keeping in view the order, ease of questioning by surveyors and answering by respondents. The questionnaire was field tested during preparation of the first monitoring report, to obtain an approximate idea of how well the draft questionnaire worked and then finalized.

The sampling method chosen for the project area is stratified random sampling, wherein each Mandal is a stratum. It is easy to implement as the sampling frame (household details for which biogas were implemented) is collected and stored in the monitoring database. Each of the five Mandals - Penukonda, Roddam, Somandepalli, Gorantla and Chilamathur was treated as a stratum. Thus sampling was done for each of the Mandal to ensure that all the areas were well represented.

5.1.5 Determination of Sample Size and Sample Size Calculations

The sample size was determined based on the parameters which need to be determined to assess the sustainable development indicators as discussed in GS passport. Determination of sample size is in accordance with Annex 06, EB 67, "Guidelines for sampling and surveys for CDM project activities and programme of activities", which specifies the reliability

requirements and describes appropriate sampling methods applicable to small-scale projects. The level of confidence and precision considered is 90/10.

The sample size required to achieve a required level of reliability was calculated based on the following formula:

$$SS = \frac{z^2 \times (p) \times (1 - p)}{C^2}$$

Where:

- SS = Sample size
 Z = Z value (e.g. 1.645 for 90% confidence level)
 P = 0.5 Percentage of population picking a choice
 C = Confidence interval, expressed as decimal (0.1 - 10% confidence interval)

$$SS = \frac{1.645^2 \times (0.5) \times (1 - 0.5)}{0.1^2} = 67.65 \approx 68$$

If we expect the response rate from the sampled households to be only 80%, then the scale up for the survey would be $43/0.8 = 54$ households.

Mandals	Total Number of Households -	Sample Size
Chilamathur	434	8
Gorantla	546	10
Penukonda	255	4
Roddam	1,110	20
Somandepalli	669	12
Total	3,014	54

Table 4: Number of households to be sampled

The details of the survey and the field studies conducted for the study is as follows:

Biogas Users		
Mandal	Number of Villages	No of Families
Chilamathur	4	21
Gorantla	5	23
Penukonda	3	15
Roddam	6	29
Somandepalli	4	18
Total	22	106

Table 5: Mandal-wise details of villages and end-user households sampled

It can be seen from Table 5 that the number of households covered for the sample surveys is more than adequate to represent the parameters in the project area. Oversampling was done as a good practice to compensate for any attrition, outliers or non-response associated with the sample.

The data collected was entered into excel sheet for data storage and analysis.

6.2 Laboratory Analysis

Samples of biogas slurry from project biogas unit and cow dung from ordinary pit were collected in separate plastic containers. These samples were tested in an accredited laboratory “Bangalore Test House”². Both the samples were analysed for total bacterial count.

6.3 Monitoring Solution

A digitised monitoring solution, customised software provided by TRISTLE Technologies Pvt, Ltd is used to monitor the CDM activity. This solution tracks all the events of the project activity i.e., selecting and managing biogas beneficiary details, construction progress of biogas unit starting from digging the pit to commissioning of unit, supplying the construction materials to the construction site and supplier or vendor details who supplies the materials, mason details, breakdown details of the unit and all other financial information regarding the project activity. Real time reports can be generated from the solution to track the project activity.

6. Data

6.1 Field Measurements

A household level questionnaire was designed to collect information for the parameters of interest. The frequency of measurement was once a year during the monitoring period.

6.2 Quality Assurance/Quality Control

The CDM survey team comprised of staff of SEDS NGO and FCN technical team. Qualified and trained people monitor the Sustainable Development parameters and emission reduction calculations. The FCN Technical team was involved in sample surveys, calculating emission reductions and writing the monitoring report. In the complete implementation and monitoring plan, SEDS, the NGO is the sole agency responsible for implementation and monitoring.

The QA/QC procedure was to achieve good quality data through field measurements. The household level questionnaire was designed and field tested before administering the actual questionnaire survey. Oversampling was done to replace non-respondents, if any. The data collected was entered by and further cross-checked by the FCN Team.

6.3 Data Analysis

The data from the survey was entered in to Microsoft excel and analyzed using MS Excel Data Analysis.

7. Results

7.1 Air Quality

Cooking using firewood results in high levels of emissions (carbon monoxide CO and particulate matter (PM_{2.5})) resulting in indoor air pollution which causes over 1.7 million

deaths per year worldwide. Many women and children in 3rd world countries are exposed to high levels of indoor air pollution. The research examines quantitative levels and health effects of particulate matter and carbon monoxide levels emitted when tradition firewood stoves are used.

In the baseline of the project area, the beneficiaries were using tradition cook stoves in order to cook and heat water. Fuelwood was the main energy source to meet their energy needs. Excessive smoke by burning fuelwood was the main cause of eye related and other health related problems like ENT, chest, burns and wounds, etc. These problems have decreased drastically after the implementation of project activity.

The biogas project has given respite to the family members especially woman from indoor air pollution. The survey revealed that after the project implementation and after women started using biogas for cooking, indoor air pollution is completely absent. The homes are clean and free of smoke, soot and other particulate matter.

After project implementation, indoor air is odourless, while in the baseline burning fuelwood left an odour in the food, on clothes, all indoors items and indoor air.

Air Quality	Before the project (No. of Beneficiaries)	After the project (No. of Beneficiaries)
Indoor smoke (%)	Present (100%)	Absent (100%)
Suspended particles in air (%)	Present (100%)	Absent (100%)

Table 6: Impact of biogas project on air quality



Figure 1: Clean Home: Odourless and free from smoke

Though the women engaged in the kitchen seem to be the main beneficiaries of the smokeless biogas, other family members indoors for eating and other purposes are benefited as well. From the above figure it is clear that the kitchens are completely free from smoke.

Health effects from indoor air pollutants range from eye irritation, headaches to more serious effects such as damage of the respiratory, nervous, reproductive, developmental and immune

systems. Survey results has shown that problems related to eyes were the most common, followed by chest and general weakness.

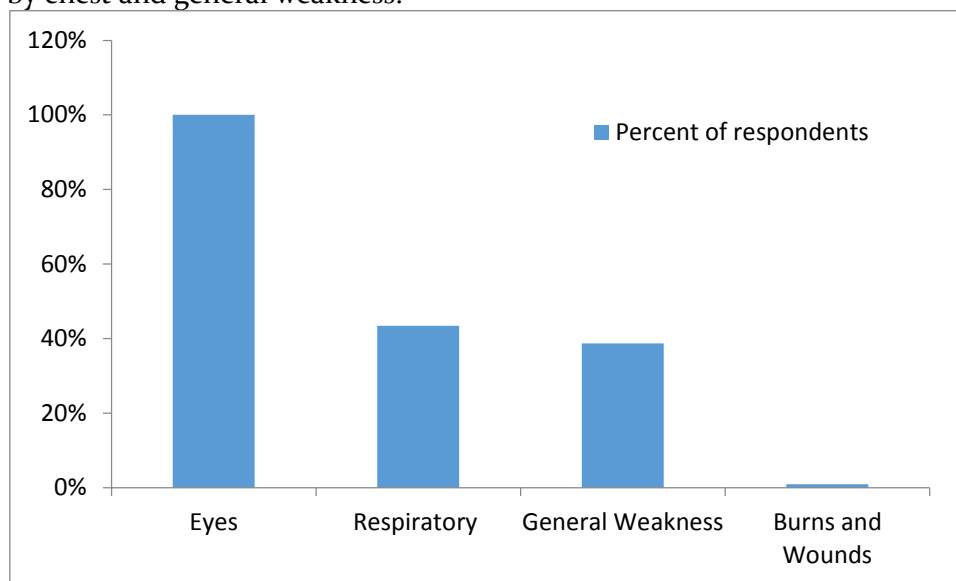


Figure 2: Positive Impact of biogas on health

From the survey, 100% respondents were rid of eye related problems, nearly 43% of general weakness and 39% of chest related problems (Fig 2). Use of biogas energy reduced indoor air pollution and thereby improving health and hygiene standards.

Thus the project activity improves indoor air quality, resulting in better health conditions of the beneficiary families.

7.2 Other Pollutants

Bio gas slurry, an end product in a biogas plant (digester) is used as organic fertilizer and acts as a waste disposal system. Biogas slurry is a digested by-product of livestock manure that contains a lot of nitrogen, phosphorus, and other macro- and micronutrients. Animal waste carries high level of microorganisms and pathogens, which cause health related problems to human and animals. Anaerobic digestion of such animal waste is considered to be an effective way to destroy pathogens as proved by various studies. According to literature, slurry has lesser number of pathogens compared to dung. A laboratory analysis was conducted on dung and biogas slurry to assess the total Bacterial Count.

The results of microbiological tests are as follows:

Microbial Tests	Dung	Biogas Slurry	Decrease
Total Bacterial Count (CFU/g)	3.65×10^7	0.95×10^7	73.97%

Table 7: Results of microbiological tests for dung and biogas slurry



Figure 3: Biogas Unit with clean surroundings

Thus the project activity reduces the number of pollutants compared to the baseline scenario resulting in better hygienic conditions.

7.3 Quality of Employment

This project activity contributed a lot towards the generation of employment to local communities and as well as business communities. Business ventures have been promoted due to construction of biogas units. So far, 31 vendors have been benefited from the project activity through supply of sand, bricks, stones, cement, stoves, pipes, valves, steel, etc. Local masons and other people are employed in construction of biogas units. Nearly 90 masons are involved in the construction of biogas units.

Trainings were held to masons, village level volunteers (VLV) and biogas beneficiary in order to improve the quality of construction, maintenance, monitoring and usage of biogas. Local Masons were trained, VLVs were trained on monitoring of the project, stove repairs and other activities related to CDM activity at SEDS office.

Trainings	No. of trainings conducted	Purpose of training
Village level trainings to end users	131	Understanding the End User Agreements & maintaining of Unit, mixing dung properly, Fixing small problems, complaining the major dome problems through VLV or Concerned Staff Stove Repair & Gobar mixing Dome maintaining Communicate skills
VLV Trainings	23	- To explain the VLV role and maintain log records, communicate and to show the biogas stove repair, gobar mixing, dome maintenance, collect the report in proper formats and submit to office

Mason Trainings	2	Training of constructing Unit - marking, digging, concrete, brick work, plastering, inlet finishing, out let finishing, dome finishing
SEDS Staff Training	14	CDM units targets, achievement & Break down units repair

Table 8: Trainings Conducted under the CDM Project activity



Figure 4: Mason Training



Figure 5: VLV Trainings



Figure 6: Training on Stove Repairs

Biogas users were trained on stove repair such as knob fixing and cleaning of pipe inside the stove and dome maintenance. They were trained to prepare dung substrate to feed biogas digester.

The main objective of the project is to get rid of woman and children from fetching fuelwood to meet their energy needs. After the project implementation, the woman and children do not collect fuel wood anymore thereby saving lot of time. This saved time is now being used for other income generating activities. The impact of the project has been enormous in terms of additional activities that have been taken up by the beneficiaries. All the respondents have taken up agriculture related activities such as working on their own fields (thus replacing one wage labour) or wage labour on others farm lands. 100% of respondents have additional time to rear cows, buffaloes, sheep and goats, thereby increasing their income levels from the sale of dairy products such as milk and other milk products (butter milk and ghee) that are earning them nearly Rs.560/monthly/family. Anantapur district is a severe drought prone area. Less rains means less yield crops and income is also less. To tide over the effects of drought, people are dependent on cattle rearing. The income generated from selling milk has become major source of their livelihood. In order to feed biogas plant with sufficient and regular quantity of dung, the households are required to have adequate number of animals which would mainly constitute more productive milking cows and buffaloes. Thus, the project activity encouraged them to keep cattle, giving them additional revenue or making it the main stream activity giving them a steady income.

The economic benefit to the communities has been in terms of direct and indirect monetary benefits. Additional economic activities taken up by women have created regular direct income to the families. Few women have taken up tailoring and few have started selling flowers. There are also indirect benefits due to biogas such as the opportunity cost of collecting fuel wood, savings from non-purchase of fuelwood, selling slurry by landless and reduction in fertilizer application and there is a considerable reduction in money spent on painting the walls of the house. People also benefited by about Rs. 400 in terms of reduction in the repainting of their home walls.

As of 30th April 2014, Rs.47 million was made as payments towards construction of biogas units in the project area, of which 24% is the wage component and the remaining is for material supply. The project activity has led to quality employment and injecting monies into the local economy.

All these income generation activities have contributed directly and indirectly to the economy of the family.

7.4 Livelihood of Poor

Firewood is the primary source of energy in rural areas of Andhra Pradesh. Nearly 80.6%³ of rural families are dependent on firewood to meet their energy needs. Survey results have shown that 100% of the families were dependent on firewood. Nearly 2 people used to spend around 5 hours/week to collect fuelwood. Before the project activity, on an average, 191 man days were spent per family/year to collect fuelwood for cooking and heating water.

The project was assessed to understand its implication in improving the livelihood of the communities in terms of time, money and labour spent for collection/purchase of fuel wood vis-à-vis the baseline, employment, poverty alleviation and access to energy. After the implementation of the project, none of the respondent beneficiaries depend on fuel wood for cooking anymore and only 1% beneficiaries' use renewable biomass such as crop residues (red gram and mulberry) and twigs and branches of *Prosopis juliflora*; a rigorous coppicing small tree for heating water occasionally.

Based on the sample survey, there has been reduction of cooking time by nearly $1\frac{3}{4}$ hours/day. In the baseline scenario, nearly $5\frac{1}{2}$ hours per day was spent on cooking, which is now reduced to $3\frac{3}{4}$ hours/day. Alongside, communities experience smoke-free kitchen now providing them a healthier indoor atmosphere. The women need not be present at the fireplace to keep it aflame, as was the practice with traditional stoves. Now they need not keep blowing air to keep the fire going, which used to affect their lungs and eyes due to smoke and particulate matter. Shortening of time in cooking, cleaning utensils etc. has given more time to women to do other activities. Now biogas is not just used for cooking food and hot water bath but also for intermittent short duration use such as preparation of tea/coffee, boiling of milk, etc.

Dung has dual role to play as a raw material for biogas unit and manure for crop production. Before the project was implemented, dung was scattered around the house and was stored in the pit which was creating unhealthy surroundings. After the implementation it is very rare to find dung scattered around the house. Now biogas users have better dung management facilities as it is fed completely to biogas digester and the slurry coming out has very less pathogens and other microorganisms. 95% of respondents said that there is a reduction of chemical fertilizers on the agricultural fields which led to the Rs 420 savings from buying chemical fertilizer.

7.5 Access to Energy Services

Biogas is a fuel gas, a mixture consisting of 65% methane (CH_4) and of 35% CO_2 . It is renewable energy resulting from anaerobic digestion of cow dung in the biogas digester. Unlike gasoline, diesel, natural gas and many other fuels, biogas (biomethane) is a renewable energy source which can be used to meet daily energy needs of the family like cooking and heating water. Biogas users have benefited a lot from the project activity in terms of ease of access to heat energy at the click of the knob just like a LPG gas stove. In the baseline, they were spending considerable amount of time and efforts for meeting this daily energy demand. The easy access of energy has generated other co-benefits to the rural communities. Biogas is used daily by all the beneficiaries. Nearly 100% of the beneficiaries do not use fuelwood for cooking anymore and only 1% of beneficiaries use crop residues and other fallen twigs and branches for heating water occasionally.

Construction and operation of 3,014 biogas units under the project activity has provided 3,014 households access to affordable and clean energy services.

7.6 Human and Institutional Capacity

For the success of any project, the most important issues are capacity building among the beneficiaries. The project should lead to empowerment, education, involvement and equal participation of women.

As mentioned earlier, after the project implementation woman and children are completely free of drudgery of collecting firewood. Previously, children would skip their early school hours or even not able to go the school as food was not cooked in time especially during rainy days. Now children reach school in time after having quality food. Now nearly 86% are able to send their children to school in time. Women find more time for other household activities and also have time to run petty shops. All the women responded that after the implementation of the project, homes are clean and water use is less for cleaning vessels. women find it easier to cook on biogas than traditional stoves. One more important change is

better visually clean surroundings as wood is not stored near their homes. Nearly 39% women responded that they are more hospitable to unexpected guests now as tea, coffee and snacks can be prepared quickly on biogas stoves and served. Now 19% of people are started using better cooking devices like cooker which saves more energy. Saved energy can be used for other heating purposes. Thus the project has led to changes in better quality of life for women of the family. She is spending less time in menial jobs and is rid of drudgery.

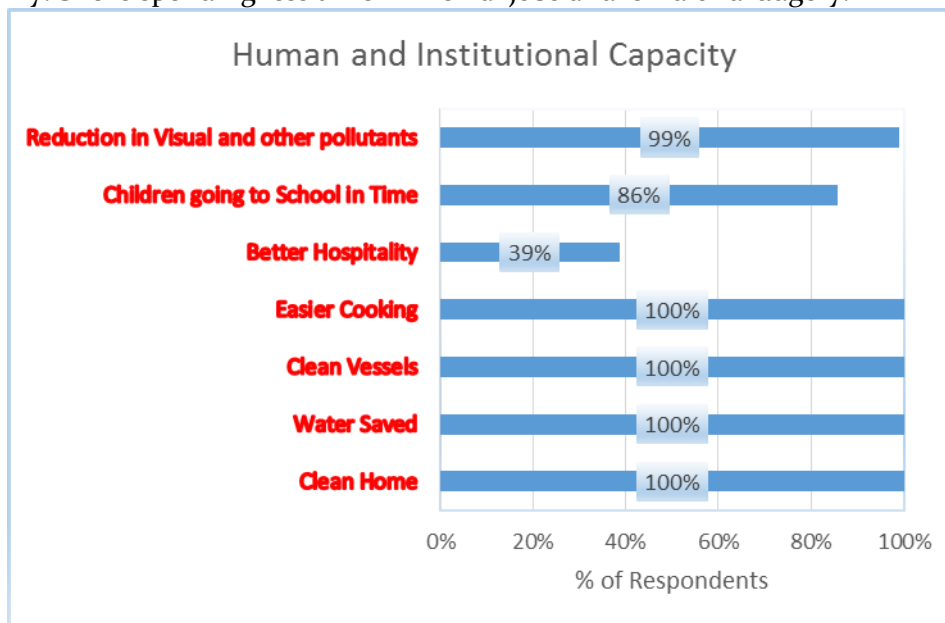


Figure 7: Human and Institutional Capacity

7.7 Quantitative employment and income generation

This project has generated more employment opportunities to local communities as well as business communities. Nearly 90 local masons and 31 local vendors are benefited from this project activity. The project has contributed to Rs. 9.1 million as wage labour for excavation and construction of biogas units during the monitoring period. The project activity has also brought in Rs.34.3 million to the local vendors through purchase of material for construction.

Biogas is constructed for the poor families without any monetary contribution from the families. As mentioned in the End User Agreement, CER revenue will be disbursed to the families after 7 years. During the initial years, the CERs will be transferred to the investor towards the purchase of forward CERs.

The family has benefitted from milch animals, which is a must for generating enough dung substrate. This is added to an income of approximately Rs. 560/month. Otherwise, in dire straits, families used to sell the cattle. In addition, the families do not have to paint their homes frequently, which cost approximately Rs.400/annum, as there is no soot on the walls.

Income generation	Rupees
Milk Income/Month	560
Money Saved on painting wall/Year	400

Table 9: Income generating activities and income from the activity

7.8 Balance of Payments and Investment

Forward funding of Rs. 70 million have been generated through forward sale of CERs for construction of 5,000 biogas units. This has been possible only after registration of the project activity as a GS CDM project activity. In the baseline, there were no dedicated budgets for complete construction of biogas plants in the project boundary. Biomass has been replaced by renewable energy for daily cooking needs of the family.

None of the families use kerosene for cooking after installation of biogas units. Thus the project has decreased use of kerosene for cooking which is an imported commodity.

7.9 Technology Transfer and Technological Self-Reliance

The project has also contributed to technology transfer and technological self-reliance. The communities are adapting to biogas. Though a proven technology and not new, its penetration is very low in the region. Thus the technology is sourced from within the country and is being introduced in a sustained way by taking up repair and maintenance by the NGO for crediting periods. This has transformed the domestic energy sector in the rural households of project area.

Spill over effects are also seen. NGOs partners, especially from the Fair Climate Network are visiting the project area to understand the project and replicate it in their regions as carbon credit projects.


As described above, a number of training programmes have been conducted to local masons. Exposure trips have been conducted to NGOs – WORD, BEST, SACRED and CROSS, which was attended by the field staff and the project directors. These trips are to assist replication of the project activity in their regions.

7.10 Conclusion

From the survey it is quite evident that this project has contributed enormously to improve the socio-economic status of the local communities. This project has brought 70 million rupees from Annex 1 country in order to help marginalised poor families in the region. Only through this fund NGO SEDS is able to implement this GS CDM Carbon offset project thereby helping poor families to improve their livelihood opportunities and to lead a quality life. Thus the project has been designed as a decentralized renewable energy activity to benefit the rural poor of a drought prone biomass deficient region of India.

Annex 1: Questionnaire

Questionnaire used to collect information on sustainable development indicators of the project activity

		SEDS Biogas CDM Project for the Rural Poor		
Fair Climate Network (FCN)		Social Education and Development Society (SEDS)		
SURVEY OF BIOGAS USERS				
Team Members:		Date of Survey		
Beneficiary Details				
Name				
District	Anantapur	Mandal		
Village Code/Name		Unit ID		
<p>Is the biogas sufficient for COOKING: YES <input type="checkbox"/> NO <input type="checkbox"/> HOT WATER: YES <input type="checkbox"/> NO <input type="checkbox"/></p> <p>If No</p> <p>1. Do you use traditional stove for cooking? Regularly <input type="checkbox"/> Occasionally <input type="checkbox"/></p> <p>2. Do you use traditional stove for heating water? Regularly <input type="checkbox"/> Occasionally <input type="checkbox"/></p>				
Source of Biomass				
Biomass Type	Species Type			
Crop Residue <input type="checkbox"/>				
Fuelwood <input type="checkbox"/>				
MONITORING SUSTAINABLE DEVELOPMENT INDICATORS				
Compared to baseline, are you preparing more number of: a) Food Varieties <input type="checkbox"/> b) Times <input type="checkbox"/> ?				
Hours of use of biogas unit/day				
Scenario	Morning (Hrs)	Afternoon (Hrs)	Evening (Hrs)	Total Hours(Hrs)
Baseline				
Project				
Air Quality	Reduction of smoke?		Yes	No
Health	Reduction in Health Problems?		Yes	No
If Yes, Reduction in	Eye irritation / Tears / Weak vision			
	Nasal irritation / Throat irritation / Ear Problem			
	Breathing Problems / Cough / Wheeze			
	Chest Pain / Rapid Pulse Rate			
	Dizziness / Tiredness / Stress / Nausea / Headache			
	Burns / Wounds		Others	
Is there reduction in water usage? Yes <input type="checkbox"/> No <input type="checkbox"/>	If Yes, for what purpose?			
	Washing Vessels <input type="checkbox"/>		Washing Clothes <input type="checkbox"/>	
	Other			



SEDS Biogas CDM Project for the Rural Poor

Fair Climate Network (FCN)

Social Education and Development Society (SEDS)

Quality of Employment / Livelihood of the Poor / Capacity Building / Income Generation / Social Impact					
		Baseline		After project implementation	
Fuel wood Purchased (P) or Collected (C)					
Time spent for fuel wood collection	No. of Hours				
	No. of Members	M→	W→	M→	W→
	Frequency				
	Mode of Collection				
	Purchase (Qty) Amount (Rs/Mode)				
How is the saved time spent now? And income generated from that activity.					
		Type of activity		Income (Rs)	
Agriculture related					
Vocational					
Dairy					
NIFP related					
Others / No Change					
Use of Biogas Slurry as Manure		Reduction in fertilizer use in fields		Yes <input type="checkbox"/> No <input type="checkbox"/>	
Social Impacts					
Eating together <input type="checkbox"/>	Clean Home <input type="checkbox"/>	Reduction in frequency of repainting the walls			
Time for socializing <input type="checkbox"/>	Water saving <input type="checkbox"/>				
Reach School in Time <input type="checkbox"/>	Clean Vessels <input type="checkbox"/>				
Better hospitality to guests <input type="checkbox"/>	Ease in cooking <input type="checkbox"/>			Yes <input type="checkbox"/> No <input type="checkbox"/>	
Others					
Is there reduction in visual or other pollutants in and around home?					
Yes <input type="checkbox"/> No <input type="checkbox"/> , If yes, specify					

Signature of the Interviewed person:

Annex 2: Training Programmes conducted during the monitoring period

Village wise Beneficiaries CDM Awareness Program

S.No	Mandal	Village	Date	No. Members Attended	Organized Staff Name
1	Roddam	Chinnamanthur	12-02-2013	23	Pakirappa & nagamani
2	Roddam	Reddipalli	12-02-2013	26	Pakirappa & Nagamani
3	Roddam	Y.T. Reddipalli	12-02-2013	22	Pakirappa, Venkataramudu & Nagamani
4	Penukonda	Kondampalli	12-03-2013	18	Govindamma & Basha
5	Chilamathur	C. Maruvapalli	02-04-2013	12	Anand & Baha & Nagamani
6	Chilamathur	Nanjireddipalli	05-04-2013	7	Anand & Basha & Nagamani
7	Chilamathur	Muddappalli	08-05-2013	8	Anand & Nagamni
8	Penukonda	Gonipeta	12-05-2013	17	Govindamma & Basha
9	Chilamathur	Thimmadipalli	12-05-2013	9	Anand & Nagamni
10	Penukonda	Mavatur	12-06-2013	12	M. Anjinappa & Nagamani
11	Chilamathur	Kandurprathi	12-06-2013	12	Anand & Basha & Nagamani
12	Chilamathur	Peddanapalli	16-06-2013	3	Anand & Nagamni
13	Chilamathur	Kammaiahgaripalli Thanda	16-06-2013	14	Anand & Nagamni
14	Chilamathur	Palepalli	16-06-2013	14	Anand & Basha
15	Chilamathur	Kanagamakulapalli	17-06-2013	4	Anand & Nagamni
16	Chilamathur	Morasalavandlapalli	20-07-2013	20	Anand & Nagamni
17	Roddam	Cherukur	12-10-2013	23	Pakirappa & nagamani
18	Roddam	Seshapuram	12-10-2013	31	M. Anjinappa & Basha
19	Roddam	Budipalli	25-11-2013	14	Pakirappa & Basha
20	Roddam	Cholemarri	25-11-2013	24	Pakirappa & nagamani
21	Roddam	Bommireddipalli	25-11-2013	28	M. Anjinappa & pakirappa
22	Roddam	Patharlapalli	26-11-2013	24	Venkataramudu & Nagamani
23	Roddam	Kambalapalli	26-11-2013	19	Venkataramudu & Nagamani

24	Roddam	Rachur	26-11-2013	22	Venkataramudu & Nagamani
25	Somandepalli	Chinnababaiahpalli	27-11-2013	20	Aswarthappa & Shaik Basha
26	Somandepalli	Gudipalli	27-11-2013	22	Aswarthappa & Shaik Basha
27	Somandepalli	Konathattupalli	27-11-2013	24	Aswarthappa & Shaik Basha
28	Somandepalli	Kugatimanipalli	27-11-2013	6	Aswarthappa & Shaik Basha
29	Somandepalli	Thungodu	27-11-2013	27	Aswarthappa & Nagamani
30	Somandepalli	Rangepalli	28-11-2013	19	Aswarthappa & Nagamani
31	Somandepalli	S. Kothapalli	28-11-2013	16	Aswarthappa & Nagamani
32	Somandepalli	Somandepalli	28-11-2013	23	Aswarthappa & Nagamani
33	Somandepalli	Julukunta	28-11-2013	28	Vijay Kumar & Shaik Basha
34	Somandepalli	Mandli	28-11-2013	17	Vijay Kumar & Shaik Basha
35	Somandepalli	Renuka Nagar	28-11-2013	6	Vijay Kumar & Shaik Basha
36	Penukonda	Parameswarapuram	29-11-2013	7	Aswarthappa & Shaik Basha
37	Roddam	Thurakalapatnam	29-11-2013	21	Venkataramudu & Nagamani
38	Roddam	Peddipalli	29-11-2013	19	Venkataramudu & Nagamani
39	Somandepalli	Kavetinagepalli	04-12-2013	18	Aswarthappa & Nagamani
40	Somandepalli	Kolimipalli	04-12-2013	15	Aswarthappa & Nagamani
41	Somandepalli	Marakuntapalli	04-12-2013	17	Aswarthappa & Nagamani
42	Gorantla	Kothuru	11-12-2013	7	Venkata Swamy, Nagamani & Bushana
43	Somandepalli	Bramhasamudram	11-12-2013	13	M. Anjinappa & Nagamani
44	Gorantla	Bellalacheruvu	11-12-2013	5	Nagabushana & Nagamani
45	Gorantla	Kaligera Thanda	11-12-2013	11	Nagabushana & Nagamani
46	Gorantla	Mallapalli	11-12-2013	23	Nagabushana & Nagamani
47	Penukonda	Chinnapareddipalli (P)	12-12-2013	26	Govindamma & Nagamani
48	Penukonda	V.G. Kottala	12-12-2013	14	Govindamma & Nagamani
49	Penukonda	Guttur	12-12-2013	23	Govindamma & Nagamani
50	Roddam	Peddakodipalli	13-12-2013	18	M. Rathnamma & Basha
51	Roddam	Bucherla	18-12-2013	18	Nagamani & Rathnamma

52	Roddam	Kottur	18-12-2013	15	Nagamani & Venkataramudu
53	Penukonda	Nallagondrayunipalli	19-12-2013	22	Narasimha Murthy & Nagamni
54	Gorantla	Gangadevipalli	19-12-2013	20	Venkata Swamy, Nagamani & Bushana
55	Gorantla	Devulacheruvu	19-12-2013	6	Nagabushana & Nagamani
56	Gorantla	Samulapalli	19-12-2013	9	Nagabushana & Nagamani
57	Penukonda	Mangapuram	20-12-2013	13	Dene Naik & shaik Basha
58	Somandepalli	Bhusaiahgaripalli	23-12-2013	12	Narasimha Murthy & Nagamni
59	Somandepalli	Naginayanicheruvu	23-12-2013	5	Narasimha Murthy & Nagamni
60	Roddam	Lakkasanipalli	24-12-2013	16	Pakkirappa & nagamani
61	Roddam	Jakkalacheruvu	24-12-2013	17	Venkataramudu & Nagamani
62	Roddam	Ragimekalapalli	24-12-2013	19	Venkataramudu & Nagamani
63	Penukonda	Suddabatlalipalli	25-12-2013	11	Nagamani & Anjinappa
64	Roddam	Kanchisamudram	25-12-2013	15	Venkataramudu & Nagamani
65	Roddam	Shapuram	25-12-2013	12	Nagamani & Venkataramudu
66	Roddam	Beedanipalli	25-12-2013	9	Venkataramudu & Nagamani
67	Gorantla	B. Gollapalli	26-12-2013	8	Venkata Swamy & Nagamani & Bushana
68	Gorantla	Pullagurlapalli	26-12-2013	7	Nagabushana & Nagamani
69	Gorantla	Thamminayanipalli	26-12-2013	17	Nagabushana & Nagamani
70	Gorantla	Mandalapalli	27-12-2013	12	Nagabushana & Nagamani
71	Gorantla	Yerriahgaripalli	27-12-2013	14	Venkata Swamy, Nagamani & Bushana
72	Penukonda	Duddebanda	30-12-2013	19	Govindamma & Nagamani
73	Penukonda	Gollapalli	30-12-2013	17	Govindamma & Nagamani
74	Penukonda	Ammavarupalli	30-12-2013	18	Govindamma & Nagamani
75	Penukonda	Haripuram	30-12-2013	10	Govindamma & Nagamani
76	Penukonda	Vaggapagarikunta	30-12-2013	16	Govindamma & Nagamani
77	Roddam	Kandukurlapalli	31-12-2013	18	Pakkirappa & Nagamani
78	Roddam	Narnagepalli	31-12-2013	25	Pakkirappa & nagamani
79	Somandepalli	Chakarlalipalli	02-01-2014	9	Vijay Kumar & Nagamani
80	Somandepalli	Challapalli	02-01-2014	10	Vijay Kumar & Nagamani

81	Somandepalli	Edulabalapuram	03-01-2014	21	Vijay Kumar & Nagamani
82	Somandepalli	Obuladevarapalli	03-01-2014	11	Vijay Kumar & Nagamani
83	Somandepalli	Pathikuntapalli	03-01-2014	13	Aswarthappa & Nagamani
84	Somandepalli	Pandiparthi	06-01-2014	16	Narasimha Murthy & Nagamni
85	Gorantla	Buganipalli	07-01-2014	5	Nagabushana & Nagamani
86	Gorantla	Buganipalli Thanda	07-01-2014	7	Nagabushana & Nagamani
87	Gorantla	Palasamudram	08-01-2014	18	Rathnamma & Nagamani
88	Gorantla	Buchepalli	08-01-2014	17	Venkata Swamy, Nagamani & Bushana
89	Gorantla	Kommula Thanda	08-01-2014	6	Nagabushana & Nagamani
90	Penukonda	Venkatareddipalli	09-01-2014	20	Nagamani & Rajkumar
91	Penukonda	Bojjireddipalli	09-01-2014	19	Nagamani & Rajkumar
92	Chilamathur	Adepalli	12-01-2014	14	Venkatesh & Nagamani
93	Chilamathur	Arumakulapalli	12-01-2014	25	Venkatesh & Nagamani
94	Chilamathur	Chagaleru	12-01-2014	13	Anand & K.N. Murthy
95	Chilamathur	B. Settipalli	12-01-2014	15	Anand & VLV & Nagamani
96	Chilamathur	Tekulodu	13-01-2014	21	Venkatesh & Nagamani
97	Chilamathur	Maruvakothapalli	13-01-2014	26	Venkatesh & Nagamani
98	Chilamathur	Madhurepalli	13-01-2014	19	Anand & VLV & Nagamani
99	Chilamathur	Kodur	14-01-2014	11	Anand & VLV & Nagamani
100	Chilamathur	Dornalapalli	14-01-2014	8	Anand & VLV & Nagamani
101	Chilamathur	Muddireddipalli	14-01-2014	18	Anand & VLV & Nagamani
102	Chilamathur	Patha Samulapalli	15-01-2014	20	Venkatesh & Nagamani
103	Chilamathur	Kambalapalli	15-01-2014	30	Venkatesh & Nagamani
104	Chilamathur	Peddireddipalli	17-01-2014	16	Nagamani & Anand & VLV
105	Chilamathur	Bhumaiahgaripalli	17-01-2014	14	Anand & VLV & Nagamani
106	Gorantla	Budidagaddapalli	17-01-2014	21	U. Venkata Swamy & Nagamani
107	Penukonda	Munimadugu	20-01-2014	17	Nagamani & Rajkumar
108	Penukonda	Adadakulapalli	21-01-2014	11	Govindamma & Nagamani
109	Penukonda	Maruvapalli	21-01-2014	11	Dene Naik & shaik Basha
110	Penukonda	Settipalli	22-01-2014	9	Dene Naik & shaik Basha

111	Roddam	Boxampalli	22-01-2014	24	M. Rathnamma & nagamani
112	Roddam	Upparapalli	22-01-2014	12	Pakkirappa & nagamani
113	Roddam	K. Maruvapalli	22-01-2014	17	M. Anjinappa & Nagamani
114	Roddam	P. Kothapalli	22-01-2014	19	Pakkirappa & nagamani
115	Gorantla	Boyalapalli	23-01-2014	22	Nagamani & Venkatesh
116	Roddam	Nallur	24-01-2014	33	Pakkirappa & nagamani
117	Roddam	M. Kothapalli	24-01-2014	18	Pakkirappa & nagamani
118	Roddam	Gowrajupalli	24-01-2014	25	Pakkirappa & nagamani
119	Chilamathur	Somagatta	03-02-2014	10	Anand & VLV & Nagamani
120	Chilamathur	Balijapalli	12-02-2014	8	Anand & VLV & Nagamani
121	Chilamathur	K. Vaddipalli	15-02-2014	7	Venkatesh & Nagamani
122	Chilamathur	D. Thummalakunta	15-02-2014	6	Venkatesh & Nagamani & VLV
123	Chilamathur	Nallarallapalli	15-02-2014	3	Venkatesh & Nagamani & VLV
124	Roddam	S.R. Kottala	22-02-2014	7	Rathnamma & VLV & Nagamani
125	Roddam	Roddam	28-02-2014	19	Rathnamma & Nagamani
126	Chilamathur	Kotlopalli	02-03-2014	22	Nagamani & Venkatesh & VLV
127	Chilamathur	Kammaiahgaripalli	02-03-2014	12	Anand & VLV & Nagamani
128	Chilamathur	Lalepalli	03-03-2014	23	Venkatesh & Nagamani & VLV
129	Roddam	Dandepalli	09-03-2014	13	Pakkirappa & nagamani
130	Roddam	Kallukunta	10-03-2014	15	Pakkirappa & nagamani
131	Somandepalli	Velagamekalapalli	02-04-2014	17	Nagamani & VLV
Total				2074	

Trainings for Village Level Volunteers (VLV)

Taluk/Mandal	Village	Date	No of present
Somandepalli	Somandepalli	10-02-2013	12
Somandepalli	Gudipalli	15-03-2013	15
Roddam	R. Kottala	18-03-2013	27
Gorantla	Gaddam Thanda	12-04-2013	18
Roddam	Roddam	16-04-2013	21
Somandepalli	Thungodu	18-04-2013	16
Somandepalli	Bhusaiahgaripalli	20-05-2013	13
Roddam	R. Maruvapalli	12-06-2013	12
Somandepalli	Manchepalli	22-06-2013	10
Somandepalli	Nadimipalli	09-07-2013	13
Chilamathur	Lalepalli	25-07-2013	18
Somandepalli	Nallagondrayunipalli	07-08-2013	14
Roddam	Seshapuram	12-08-2013	29
Gorantla	Buchepalli	14-08-2013	18
Roddam	R. Locherla	16-08-2013	30
Gorantla	Kamgareddipalli	12-09-2013	18
Penukonda	V.G. Kottala	13-10-2013	28
Somandepalli	Edulabalapuram	20-11-2013	19
Penukonda	Munimadugu	20-11-2013	26
SEDS Office, Anandapuram	Anandapuram	10-12-2013	29
SEDS Office, Anandapuram	Anandapuram	12-02-2014	30
Somandepalli, Gorantla, Chilamathur	Petakunta	28-03-2014	37
SEDS Office, Anandapuram	Anandapuram	29-03-2014	32

Training Programs for Biogas Masons

S.No	Location	Date	No of present
1	Somandepalli Mandal Anandapuram village	22-07-2013	39
2	Roddam Mandal, Seshapuram.	16-01-2014	34

Trainings for SEDS CDM Staff

Sl.No	Location	Date	No. Members Attended
1	Seds Office, Anandapuram	19/07/2013	15
2	Seds Office, Anandapuram	05-11-2013	9
3	Seds Office, Anandapuram	30/11/2013	15
4	Seds Office, Anandapuram	07-12-2013	15
5	Seds Office, Anandapuram	14/12/2013	13
6	Seds Office, Anandapuram	21/12/2013	15
7	Seds Office, Anandapuram	28/12/2013	15
8	Seds Office, Anandapuram	04-01-2014	16
9	Seds Office, Anandapuram	18/01/2014	12

10	Seds Office, Anandapuram	08-02-2014	14
11	Seds Office, Anandapuram	14/02/2014	12
12	Seds Office, Anandapuram	22/02/2014	12
13	Seds Office, Anandapuram	08-03-2014	16
14	Seds Office, Anandapuram	29-03-2014	18
Total			197

References

¹ http://cdm.unfccc.int/sunsetcms/storage/contents/stored-file-20131010103828368/meth_guid48.pdf

² <http://www.bthindia.com/>

³ NSSO 2010. National Sample Survey Organization, Household Consumer Expenditure in India, Ministry of Statistics and Programme Implementation, Government of India.(Page no A 38)