# THE GOLD STANDARD:
# Project Design Document for Gold Standard Voluntary Offset projects

# (GS-VER-PDD)

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Explanatory information on how to complete the PDD and how to obtain Gold Standard registration can be found in the project developer's manual available on the Gold Standard website.

This template of the PDD is applicable for micro-, small- and large-scale projects. Note that the shaded boxes present information on the Gold Standard VER project development procedures. Project developers should delete these shaded boxes when preparing their PDD.

# VOLUNTARY OFFSET PROJECTS

# PROJECT DESIGN DOCUMENT FORM (GS-VER-PDD)
**Version 01 - in effect as of: January 2006)**

## CONTENTS



## Annexes

## SECTION A. General description of project activity

### A.1 Title of the project activity

Title: Arakalagudu Biodigester Project II
Version: 01
Date: 19/08/2010
Version: 03
Date: 10/12/2010
Version: 04
Date: 23/12/2010

### A.2. Description of the project activity

The biogas project has been initiated by "SKG Sangha" (henceforth SKGS), a non-governmental organization (NGO), based in the Karnataka State, India. This project involves implementation of 790 biogas and vermicomposting units. This GS-microscale project has been funded by "GoodPlanet" foundation (a French non-profit organization, based in Paris).

**Purpose of the project**

GoodPlanet and SKGS have already registered one Gold Standard micro-scale biogas project (GS 615) in the same district (Hassan) of Karnataka. The first project has provided biogas and vermicompost units to 516 families in Hassan District. The purpose of this project is to provide similar type of biogas plant and vermicomposting units to 790 individual families in the villages of Arakalagudu Taluk, Hassan District, Karnataka state, India. This second biogas project has been initiated by SKGS in the same district due increase in demand for biogas units from the neighboring local beneficiaries after witnessing a successful completion of the first biogas project (GS 615) in the district.

Most of families in rural India rely on firewood for cooking purposes. Collecting firewood engages not only the women of the household but sometimes the children as well. Cooking with firewood is not only time-consuming and but also emits smoke which has been a cause of serious health issues. According to the World Health Organization (WHO) report, more than 1,6-million people are dying every year from the effects of breathing in poisonous smoke from animal dung, wood and coal used for cooking[1]. It has been observed that it is a regular practice among the agricultural communities to store the animal dung in backyard pit and use it as organic compost. The agricultural residues are left on the side of the fields, and decompose in lagoons during the rainy seasons. Therefore, the project aims to achieve two distinct goals – first, is to replace firewood used for cooking and secondly, provide a vermin compost unit that would utilize the biogas slurry along with the kitchen waste and the agricultural residues to produce organic compost that would reduce and/or replace the use the of chemical fertilizers for agricultural activities.

The biogas plants are 2m$^3$ fixed dome type (Deenbandhu model) plants. On a daily basis the biodigesters should be fed with 50 kg of cow dung and 45 liters of wastewater. They will produce enough biogas to sustain the families' need for cooking energy and will replace non-renewable firewood and kerosene in the project area. The vermicompost unit, fed with a mix of slurry from the biodigester and agricultural residues, will produce on an average 8 tons of vermicompost every year. Based on a double decomposition process, the first three weeks involves aerobic decomposition with frequent turning, followed by a second decomposition operated by earthworms, the vermicompost unit will produce very good compost, rich in nitrogen and minerals. The families themselves will use part of the vermicompost, instead of the chemical fertilizers and the rest will be sold for an average price of 3Rs[(2)] per

[1] http://www.who.int/mediacentre/news/statements/2004/statement5/en/

[2] 1 €= 56 Rs (as on June 2010)

kg, providing an extra source of income for the families. The benefits of the additional income from the vermicompost depend on the amount of chemical fertilizers replaced for the agricultural purpose and the remaining quantity of vermicompost available for selling. Generally, the additional income is not much but at least it acts as incentive to promote vermicomposting in the region and reduces the excessive use of chemical fertilizers.

## Implementation of the project

The project will be implemented by SKGS. There has been rise in demand for the biogas units as the beneficiaries have already witnessed a successful implementation of a similar biogas programme by SKGS in the neighboring villages. This project aims to build another 790 biogas and vermicompost units in the Arakalagudu taluk even though the actual demand of biogas units in the project area are definitely more than the number of units funded through this project activity. Out of the 37186[3] numbers of families in Arakalagudu Taluk, 790 beneficiaries have been selected due to the limited funding for this project. The implementations of any biogas project by SKGS are carried in the following steps: -

- Beneficiaries interested in a biogas unit have to either send an application and / or contact the SKGS team.
- The SKGS team visits the beneficiary to check if the basic requirements like availability of land for constructing the units, minimum 2 animals per family to assure a regular supply of animal dung.
- The signing of agreement between SKGS and the beneficiary selected for the project activity and acceptance to regularly use the biogas units and also participate in the monitoring requirements.
- The construction of the units for each beneficiary and this is followed by a regular monitoring and maintenance of the units, which is provided by the SKGS team.

For this project activity, the beneficiaries had been contacting the SKGS staff members during their field visit to implement the biogas and vermi-composting unit since they had already witnessed a successful biogas project by SKGS in the neighboring villages. Most of the interested beneficiaries had participated in the Local stakeholder meeting and given their application to SKGS during the meeting. The team visited the families that had applied and checked the basic requirement to install the plants like availability of land near the house, availability of minimum number of cattle and the interest of the beneficiary. This was carried out in January 2010, after the stakeholder meeting. The implementation of the units started once the selected beneficiaries were notified by the SKGS team members.

Once the above steps have been completed, SKGS also provides a biogas stove and the earthworms necessary for the production of the first batch of vermicompost. SKGS will train the beneficiaries for two days on the usage of biodigester and production of vermicompost so that they can use it correctly and efficiently. SKG will hire few of the capable youth from the families of the beneficiaries as full-time workers and train them properly during the process of project implementation, and for future maintenance and monitoring of the composite unit. If needed, they will call the Hassan SKGS office in order to repair the units, give further training, and/or help beneficiaries sell their vermicompost.

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## How the project mitigates GHG emissions

The project mitigates GHG emissions by avoiding the use of firewood for daily cooking needs, and dumping of the cattle dung, kitchen waste and agricultural waste biomass in traditional composite pit leading to methane emissions.

[3] Source: Hassan district at a glance 2006-07 by District Statistical Office, Hassan , Page number 89, based on 2001 census

There is a continuous demand on the forests for the daily firewood needs, and distances for collecting wood have increased in the last years. Nowadays, the average distance to collect firewood is 1.2 km (baseline study), and it is increasing every year. The non-renewability rate of the firewood in Hassan district has been assessed to be 53,90%[4]. The project provides the families a clean and efficient fuel that will replace this non-renewable firewood, and avoid the GHG emissions from burning of firewood that causes deforestation and degradation of forest resources.

The common practice in the project area for waste management is having a traditional compost pit near the house, as there are no other authorized waste disposal sites in the rural areas. Therefore the daily cattle dung from the animal shed is mixed with agricultural residues and fodder waste is directly dumped into these open pits. The materials in the pits are not rotated, which leads to a anaerobic condition in the pit. During the rainy season, these pits are always wet, and the decomposition of the dung and agricultural wastes in such conditions emit methane. These methane emissions into the atmosphere will be avoided due to the project activity since the dung will be utilized in the biodigester, and the methane from the biogas plant will be burnt as a fuel for daily cooking needs of the family. The methane emissions from agricultural waste decomposition in the composting pit and from agricultural wastes left on the side of the fields will be avoided by composting them in aerobic conditions in the vermicompost unit. *These emission reductions will not be counted because they are not included in the methodology.* The production and spread of chemical fertilizers emit GHG gases (such as $N_2O$ and $CO_2$) that will be avoided by the use of vermicompost. These emission reductions due to the displacement of chemical fertilizers will not be calculated because it is not in the methodology boundaries. *The emission reductions from feeding the wastewaters in the biodigester will not be calculated either.*

## Contribution to Sustainable Development

The contribution for sustainable development by the project activity has been carried out with the help of the Gold standard (GS-toolkit) guidance on the 'sustainability assessment' through the following way:

1. All the sustainable indicators listed in GS guidance document were taken into account. These indicators corresponded to most of the social, economic, health and environmental aspects that might directly or indirectly be affected by the project activity.
2. The sustainable indicators were not only assessed by the project participants but also by cross checking the assessment with the local stakeholders and the beneficiaries (blind sustainable development matrix) of the project activity during the stakeholder meetings.
3. The sustainable assessment of the project included:
   - The 'Do not harm assessment', which assures that the project activity does not threat the safeguarding principles of the UNDP which have been derived from the Millennium Development Goals (MDG's).
   - The 'Detailed impact assessment – sustainable development matrix', to understand how the considered parameters that have been assessed can also impact the MDG and to assure the project promotes sustainable development in the region. Each of the indicators impact in terms environmental, social, economic and technological development in the region, have been scored as '-' (negative impact, '+'(positive impact) or '0'(neutral impact). The sustainable development matrix has been provided below with the scores for each indicator.

A detailed sustainability assessment table with justifications for the relevant indicators has been provided below and the complete report of the 'Local Stakeholder Consultation' (LHSC) document can be accessed on the Gold Standard registry for further references on the sustainability assessment of the project.

[4] Baseline Study on the Renewability of the biomass used in Hassan disctrict. The report is available on the Gold Standard registry.

| Indicator | Mitigation measure | Relevance to achieving MDG | Chosen parameter and explanation | Preliminary score |
|---|---|---|---|---|
| Gold Standard indicators of sustainable development | If relevant, copy mitigation measure from 'Do No Harm' assessment, and include mitigation measure used to neutralise a score of '-' | Check www.undp.org/mdg and www.mdgmonitor.org<br><br>Describe how your indicator is related to local MDG goals | Defined by project developer | Negative impact: score '-' in case negative impact is not fully mitigated, score '0' in case impact is planned to be fully mitigated<br><br>No change in impact: score '0'<br><br>Positive impact: score '+' |
| Air quality | To check if there are any gas leakages in the pipes, that carries the gas from the tank to the burner. | MDG – Environmental sustainability.<br>Biogas replaces the use of wood-stoves or other fossil based cooking-stoves. | Methane emissions ($CH_4$)<br>Odour - The strong odour of cow-dung is avoided by its use in the biogas plant. | + |
| Water quality and quantity | -------- | MDG – Environmental sustainability.<br>The biogas plant does not affect the quality of the water as it requires very little water and also, it does not affect the availability of the water resource in the region. | Total amount of water utilised. (Litres/yr)<br>The parameter will give comparison between the amount of available water in the area and quantity of water used for the biogas plant. | 0 |

| | | | | |
|---|---|---|---|---|
| Soil condition | Production of vermin-compost and help improves the fertility of the agricultural soil. | MDG's – universal education and environmental sustainability.<br>- By training the rural population about the benefits of biogas over firewood and reducing the excess use of the chemical fertilisers for agriculture by utilising the vermi-compost. | Vermi-compost production (tons/yr).<br>The monitoring report will give detailed information if there have been any changes in the crop-yield by using the vermi-compost.<br>Soil improvement through the use of the vermi-compost. | + |
| Other pollutants | -------- | | Biogas production.<br>This will give the amount of avoided firewood that might have been used in the absence of the biogas and giving rise to pollutants like particulate matters, NOx, SOx. | 0 |
| Biodiversity | -------- | MDG – environment sustainability. | Though the project does not directly relate to the development of the biodiversity of the project area but at least SKGS will monitor the project annually to make sure that beneficiaries are continuously using the biogas and do not switch back to firewood. In the long-term the project will help to restore the forest which can sustain various species both plant and animals depending on this forest area. | 0 |
| Quality of employment | -------- | -------- | In the baseline, the cow-dung would have left for natural decay leading to methane emissions. In the project the cow-dung is used to produce biogas and its waste is used for the production of vermi-compost. The utilisation and sales of the vermi-compost will be part of the project monitoring report. Also in this project the women are the playing an important role who use both the biogas and the vermicomposting units which helps them to be self-employed and have the possibilities to have a permanent source of income and whereas in the baseline scenario the women had no source of | +---- |

| | | | | |
|---|---|---|---|---|
| | | | income and were dependent on their husbands for any financial needs. | |
| Livelihood of the poor | To check the vermin-composting unit on a regular basis. | MDG –End poverty and hunger. | Income by vermi-compost. The vermi-compost can be sold and thus making sure an additional income source to the poor families. | + |
| Access to affordable and clean energy services | -------- | MDG – end poverty and hunger. | Total biogas production.<br>This gives the total amount of the biogas produced assuring the working and continuous gas supply from the biogas plant. | + |
| Human and institutional capacity | -------- | MDG- MDG – End poverty and hunger, Gender equality and universal education. | Training Programmes<br>SKGS provides a regular formation programme to the beneficiaries to assure an efficient use of the biogas and vermicomposting units. Since the project replaces the use of firewood, the women of the household show keen interests in such trainings as they also benefit from the project that relieves them from the health issues that would have caused due to the smoke from the use of firewood | + |
| Quantitative employment and income generation | -------- | MDG – environment sustainability. End poverty and hunger, Gender equality and universal education. | Household income/saving generated from the vermicompost production: -<br>The project will not directly provide employment to all the beneficiaries but will be a source to produce vermicompost that can replace the use of chemical fertilisers and thus reducing their annual expenditures. The vermicompost can also be a source of income generation to the beneficiaries if they can produce enough organic compost for their agricultural needs and sell the remaining additional vermicompost. | 0 |
| Balance of Payment and | -------- | -------- | The project does not address this indicator directly | 0 |

| | | | | |
|---|---|---|---|---|
| investment | | | | |
| Technology transfer and technological self-reliance | Regular check of the biogas plant by the NGO for an assurance of the working condition. | MDG – End poverty and hunger, universal education. | Training – the beneficiaries are being trained about the functioning of the biogas and about the precautionary actions needed. | + |
| **Justification choices, data source and provision of references**<br>A justification paragraph and reference source is required for each indicator, regardless of score References can be an academic or non-academic source, such as a university research document, a feasibility study report, EIA, relevant website, etc. | | | | |
| | | | | |
| Air quality | The project aims to replace the firewood used for cooking by the biogas The indoor air quality improves due to the project as unlike firewood, biogas produces no smoke[5]. The project reduces the methane emissions that would have occurred if the cow-dung as left to decay on the field[6]. The foul smell of the cow-dung is also reduced making sure a hygienic environment for the beneficiaries in the project area | | | |
| Water quality and quantity | The project does not affect the quantity of water in the project region, as it requires a very small amount of water to produce the biogas. The important water sources in the project area are tanks and groundwater[7] through which the beneficiaries in the project area have access to sufficient amount of water that can be utilised for the biodigester. The water quality in the region will not be affected, as the project does not discharge any waste that might affect the water resources of the area. The project participants will assure that the vermicompost units are emptied by the beneficiaries so as to avoid ay leachate formations. | | | |
| Soil condition | Indian soil being very poor in organic matter and major plant nutrients, addition of regular doses of organic manures in | | | |

[5] http://www.unu.edu/unupress/food/8F023e/8F023E06.htm

[6] http://www.methanetomarketsindia.com/sectors/agri.htm

[7] Working paper – A case study of Arakalagudu taluk, B K Harish Kumar, K Lenin Babu.-Pg -3.
http://docs.google.com/viewer?a=v&q=cache:2U43pUHmhbcJ:www.isec.ac.in/WP%2520-%2520214.pdf+arakalagudu+water+table&hl=en&pid=bl&srcid=ADGEESiEitzJuRjLbRWzsNR1th3nuoG0bIKKobaTO1S3joUbl4enUofWjeydD48qnv3a4mxNeig4e_651n1ZnQQkIMzJvrX_qWnHAfVVRG079eTeQQOKk5Psj-CXWp-nspXHpfilwWSz&sig=AHIEtbTfqxig_9PfTdtm6f7tO8A-Ys8LiA

| | |
|---|---|
| | requisite quantities can help restoration of soil health and also compensate the loss of basic nutrients of every year from soil due to uptake of crops[8]. The slurry from the biogas plant is further utilised to make organic compost with the help of the agricultural waste and earthworms. The compost is called as vermicompost and is further utilised as an organic fertilisers in the farm. One of the recent studies on the benefits of vermicompost has shown that vermicompost has more of available nutrients than regular FYM or compost. Secretions of earthworms that are in the vermicompost serve as plant growth stimulatory factors and vermicompost can provide answer to the question of whether organic manure application can fulfil the requirements of high yielding, sensitive crops that are promoted in recent years[9]. Vermicompost is an excellent, nutrient-rich organic fertilizer and soil conditioner[10]. |
| Other pollutants | The biogas project reduces other pollutants that might have been caused due to the use of firewood for daily cooking needs of the beneficiaries in the project area. |
| Biodiversity | The project does not address this indicator directly. The project aims to replace the use of firewood for cooking by the biogas and helps to reduce the non-renewable biomass rate in the area. The project would thereby help to conserve the trees in the area. |
| Quality of employment | The vermicomposting unit is generally managed by the women and gives the beneficiaries an opportunity to be self-employed. The additional income by selling the vermicompost depends on the needs for agricultural activities of each family participating in the project. Vermicomposting technology is easy to practice, ecologically safe, economically sound and can create more employment opportunities for the rural people to upgrade their standard of living.[11]While implementation the project, SKGS takes cares of labour conditions, health, safety requirements till the units are constructed. The project generates temporary employment as there is a need of additional manpower during the construction of the units. |
| Livelihood of the poor | The implementation of the projects uplifts the livelihood of the poor by assuring a continuous supply of biogas, reducing the dependence on the forest and saving investments on chemical fertilisers by using the organic vermicompost[12]. |
| Access to affordable and clean energy services | The biogas plant is source to affordable and clean energy[13]. The project beneficiaries have to bear a part of the material cost or volunteer in the construction of the biogas. The other remaining cost is borne by the SKG Sangha, thus making sure that |

[8] http://update.kvic.org.in/activities_biotechnology.htm

[9] Research on earthworms in India with special reference to vermiculture - Radha D. Kale (pg – 9)

[10] http://www.ashdenawards.org/winners/skgsangha

[11] http://www.eco-web.com/edi/index.htm

[12] Vermiculture and Vermicomposting Biotechnology for Organic Farming and Rural Economic Development. By P. Rajendran[1], E. Jayakumar[1], Sripathi Kandula[2] (a copy of the paper has been uploaded on the GS registry) – Pg 1.

| | |
|---|---|
| | the biogas plant is affordable to the poor. |
| Human and institutional capacity | The biogas project addresses the health issues of the women who have been using firewood in a less ventilated kitchens leading to respiratory problems[14]. To assure that the women use the units in a efficient manner, SKGS provides a thorough guidance to the women operate the units. |
| Quantitative employment and income generation | The household income of the beneficiaries would change due to either from the savings occurred by replacing chemical fertilisers by vermicompost and secondly from using the biogas units that would replace the firewood and kerosene. |
| Balance of payments and investment | The project does not address this indicator directly. |
| Technology transfer and technological self-reliance | To make sure that the biogas functions properly in its future, the beneficiaries are being trained on the maintenance and working of the biogas by the technical team of the SKG Sangha. A regular training programme is carried out by SKGS for their local technical staff. One of the recent training photographs has been provided in the Annexe. |

[13] Report by Government of India, Ministry of Non-Conventional Energy Sources – Biogas (Pg 8).

[14] http://www.indg.in/rural-energy/schemes/rural-energy/re-women-energy/

## A.3. Project Participants

| Name of Party involved (*) ((host) indicates a host Party) | Private and/or public entity(ies) project participants (*) (as applicable) | Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No) |
|---|---|---|
| Republic of India | SKG Sangha, India.<br>GoodPlanet Foundation, France. | No |

## A.4. Technical description of the project activity:

### A.4.1. Location of the project activity:

#### A.4.1.1. Host Party(ies):

Republic of India

#### A.4.1.2. Region/State/Province etc.:

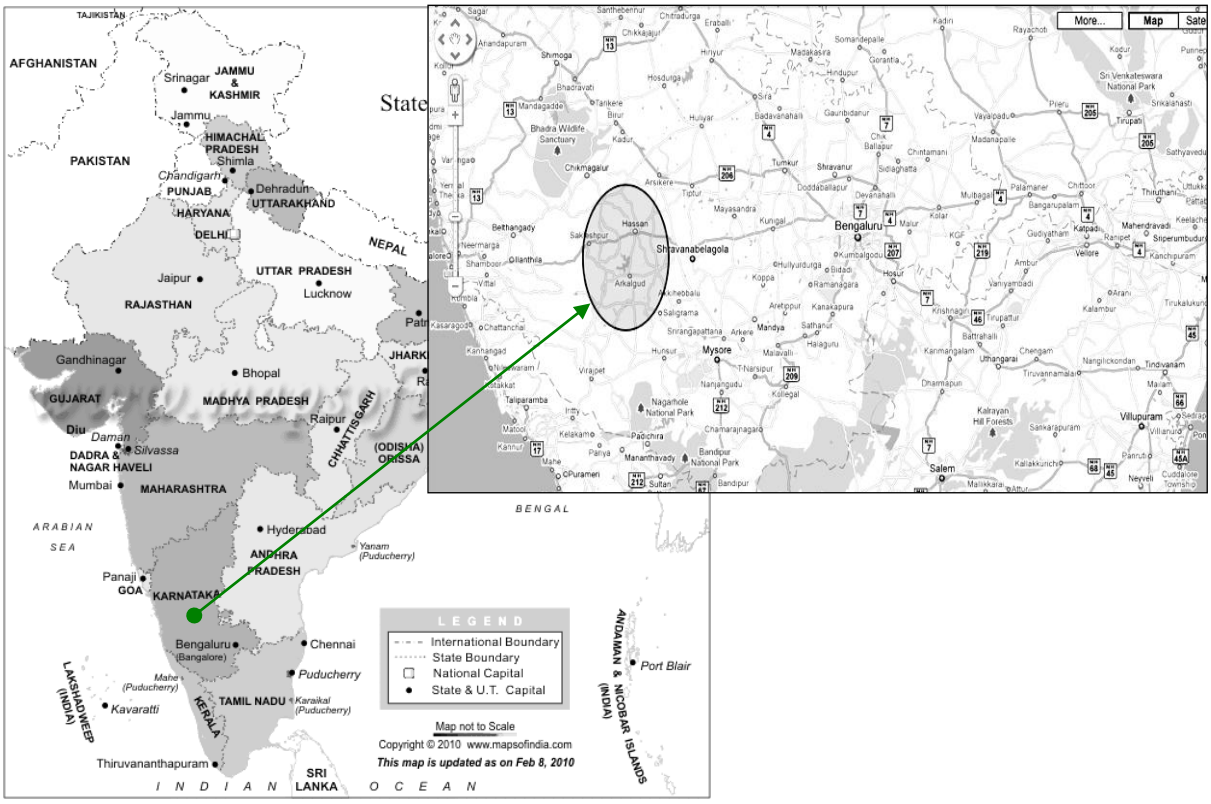
Arakalagudu Taluk, Hassan district, Karnataka State,

#### A.4.1.3. City/Town/Community etc:

The composite vermicompost & biogas units will be installed in several villages of Arakalagudu Taluk. The exact location of all the biodigesters will be available on the Database of the project, and each biodigester has been identified with a serial number and the name of the implementing organisations. (Photo of a completed unit provided in the Annexes). To assure that there is no double counting of units, a separate database for the project is maintained with detailed address, photos, unit number, and the name of the villages, for each of the beneficiaries in the project activity. A details list can be provided during the verification process.

#### A.4.1.4. Detail of physical location, including information allowing the unique identification of this project activity (maximum one page):

**Figure 1 : Location of Hassan District**




| | | Co-ordinates. |
|---|---|---|
| **Longitude** | X1 | 75° 56' 2.86 '' |
| | X2 | 76° 11' 47.15'' |
| **Latitude** | Y1 | 12° 30' 40.71'' |
| | Y2 | 12° 49' 53.07 '' |

**A.4.2. Size of the project:**

The Project reduces less than 5000tCO2/yr and therefore is a GS-VER micro-scale project.

**A.4.3. Category(ies) of project activity:**

According to the GS Toolkit annexes C, the project activity falls under the "Biogas" category.

**A.4.4. Brief explanation of how the anthropogenic emissions of anthropogenic greenhouse gas (GHGs) by sources are to be reduced by the proposed project activity, including why the emission reductions would not occur in the absence of the proposed project activity, taking into account national and/or sectoral policies and circumstances:**

**How the project reduces GHG emissions**

The project will reduce GHG emissions from three potential sources – firewood used for cooking, cattle dung and agricultural waste residues. The project will be implemented for 790 rural families who depend on firewood for their daily cooking needs. Each beneficiary in the project will be provided with a biodigester and a vermicomposting unit. The biogas generated will be utilised for the daily cooking needs and the biodigester slurry will be mixed with the agricultural waste residues to be further decomposed with the help of earthworms in an aerobic process to produce nutrient rich vermicompost. The biogas is composed approximately of 40% $CO_2$ and 60% of $CH_4$, with traces of other

gases. During the combustion of biogas, mainly $CO_2$ will be emitted. These $CO_2$ emissions from biogas incineration are $CO_2$ neutral since the natural decomposition of cow dung would have emitted as much $CO_2$. In absence of the project, the households would continue using firewood and kerosene for cooking purposes. As the firewood is 53,90% non-renewable, emissions from deforestation would occur. The use of vermicomposting units will avoid the disposal of the cattle dung and agricultural wastes in the traditional compost pits that are usually left to decay naturally leading to anaerobic condition in the pits that would emit the GHG's in the atmosphere.

**Why the emission reductions would not occur in the absence of the proposed project activity**

As explained, the project activity will reduce GHG emissions by providing a biogas and vermicomposting units to each beneficiaries in the project activity. These emission reductions would not occur in the absence of the project activity due to the following reasons: -

Firstly the beneficiaries of the project activity depend mainly on firewood for their daily cooking needs, as the availability of other fuels like LPG and Kerosene is less. Using firewood not only emits GHG's but also affects the health of the women due to the continuous exposure to firewood smoke in the kitchens, which have bad ventilation. Beneficiaries will continue using the firewood for cooking unless they have option of other fuels that are accessible regularly and are not expensive. There is no regular supply of LPG in the project area and the availability/cost of kerosene does not satisfy the beneficiaries' demand of fuel for daily cooking needs. The possibility of being benefited by the Government biogas programme is very less this year as the number of biogas units allocated for the entire state is 10000 units whereas the demand for biogas units in the Hassan District itself is more than 50000. Therefore, with the present situation, the only option for the beneficiaries would be to use firewood for their cooking purpose.

Secondly, the beneficiaries in the project are the farming community with minimum of 2-3 cattle's. There are no specific solid waste disposal sites managed and/or maintained by the local people in the rural areas. Therefore each beneficiary has an open pit (commonly known as back-yard pits) with on an average of 1,5 meters in depth. The daily cattle dung collected from the animal shed is usually dumped in these pits with other agricultural residues and kitchen waste. This pit is never rotated and over a period of time undergoes anaerobic condition leading to GHG emissions. Therefore in the absence of the project activity the beneficiaries would have continued the practice to dump the wastes in the traditional compost pit that would have led to the GHG emissions due to anaerobic conditions.

### A.4.4.1. Estimated amount of emission reductions over the crediting period:

| **Years** | **Annual estimation of emission reductions in tons of $CO_2$ e** |
|---|---|
| 2010 *(1/04/2010 till 31/12/2010)* | 2392 |
| 2011 | 3189 |
| 2012 | 4989 |
| 2013 | 4989 |
| 2014 | 4989 |
| 2015 | 4989 |
| 2016 | 4989 |
| 2017 | 4989 |
| 2018 | 4989 |
| 2019-2020 *(1/01/2019 till 31/03/2020)* | 6236 |
| **Total emission reductions** (tons of $CO_2$ e) | 46736 |
| **Total number of crediting years** | 10 |
| **Annual average over the crediting period of estimated reductions** (tons of $CO_2$e) | 4674 |

Till date about 505 biodigesters and vermicomposting units have been constructed in the project. The remaining 285 units will be constructed in the following year. The above emission reductions will be revised as per the total number of units constructed during each monitoring period.

## SECTION B. Application of a baseline methodology

### B.1. Title and reference of the approved baseline methodology applied to the project activity:

Indicative programme, baseline, and monitoring methodology for Small Scale Biodigester (Version 1.0).

#### B.1.1. Justification of the choice of the methodology and why it is applicable to the project activity:

This methodology is applicable as per definition of Section I of the Indicative programme, baseline, and monitoring methodology for Small Scale Biodigester, Voluntary Gold Standard:

> This methodology is applicable to programmes of activities involving the implementation of biodigester in households within the project's boundaries. The project activity is implemented by a project coordinator who acts as the project participant. The individual households will not act as project participants. The consumption of biogas from the biodigester replaces the consumption of fossil fuel and/or biomass.
>
> Furthermore, the following conditions apply to the methodology:
> - The biodigester programme promotes the wide-scale use of biogas as substitute for wood, agricultural residues, animal dung and fossil fuels that are presently used for the cooking, space heating and lighting needs of most rural households.
> - The methodology applies to project with biodigesters with a maximum total biodigester volume of 20 m3.
> - The biodigesters in the programme are not included in another CDM or voluntary market project (i.e. no double counting takes place),
> - If more than one climate zone is included in the project, the project should make a distinction per climate zone.

SKGS has implemented the biodigesters project and the individual households are not project participants[15]. The volume of implemented biodigesters is 2$m^3$ and is used for cooking purposes, by replacing firewood and kerosene. This program is entirely funded through Voluntary Market and is not included in other CDM or voluntary market projects. The project is located in Arakalagudu Taluk of Hassan district, which belongs to one climatic zone.
This program is a micro scale as it reduces on an average 4674 tons of $CO_2e$ per year, which is less than the threshold of 5000 tons of $CO_2e$ per year, as per the guidelines in the GS toolkit. .

### B.2. Description of how the methodology is applied in the context of the project activity:

As per section II of the methodology, two main points are to be studied in order to determine the baseline scenario: the most plausible scenario and the assessment of suppressed and satisfied demand

**A) The most plausible scenario**

The methodology offers two possibilities:

- The baseline scenario is the pre-project scenario i.e. the situation before the implementation of the project
- The baseline scenario is the situation where fossil fuels are used to meet energy service needs (even if they are not currently being used).

The latter scenario is not the most plausible for several reasons:

- Though the government provides kerosene at a subsidized rate, the availability of kerosene is less compared to the growing demand in the project area. The barriers for a regular continuous supply of kerosene have further been elaborated with justification in the following paragraphs of the document.

[15] A copy of the Agreement between beneficiaries and SKG Sangha has been uploaded on the GS registry.

Moreover, LPG is not easily available in the rural areas of Hassan district due to lack of infrastructure. To buy/ or refill the LPG tanks it involves long traveling distances , and sometimes, due to high demand the supply of LPG is not very regular.

Therefore, as a switch to fossil fuel is not likely to occur in the next few years, the most plausible baseline scenario is the pre-project situation, in which firewood is the main cooking fuel used.

### B) Suppressed Demand

The chapter 4 section II of the methodology introduces the concept of satisfied and suppressed demand:

> "Suppressed demand" is the situation where energy services provided are insufficient – due to poverty or lack of access to modern energy infrastructure – to meet the needs of stakeholders given their human development needs.
>
> "Satisfied demand" is the situation where suppressed demand is satisfied through an increase in energy use (i.e. from an accessible and/or more affordable energy source).

In the case of Hassan District, families are using wood for cooking and water heating purposes.
The families are mostly the agricultural communities in the villages of Arakalagudu Taluk, therefore their earning potential to invest for alternatives like LPG for their daily energy needs is very less. They find the option of firewood to be cheaper and practical but they are unaware of the effects of this increasing consumption of firewood on the forest resource. As they are left with no option they travel long distances to collect the firewood. This clearly states a suppressed demand as per the above-mentioned definition of suppressed demand. Therefore the baseline selected here is pre-project situation with suppressed demand. A previous study had been undertaken to assess suppressed demand in Hassan District[16]. For that purpose, a comparison was drawn between the wood consumption of people who are already equipped with biodigesters (thanks to older biogas projects) and the consumption figures of people who don't have biodigesters.

Finally, the baseline scenario chosen is the pre-project scenario with suppressed demand.
The key parameters to determine this baseline scenario are displayed in the table below.

| Name | Description | Values | Source |
|---|---|---|---|
| $FC_{firewood,h}$ | Wood consumption for cooking purposes of beneficiaries before the implementation of biodigesters for household h, kg | 10,12 kg/HH/day | Study undertaken by SKGS |
| NRB | Non renewability rate of wood in Hassan District, dimensionless | 53,90 % | Study undertaken by SKGS |
| $NCV_{firewood}$ | Net calorific value of wood, $TJ.Gg^{-1}$ | 15,6 TJ/Gg | IPCC Guidelines 2006[17] |
| $EF_{firewood}$ | Emission factor of wood for CO2, $tonsCO2.TJ^{-1}$ | 112 T CO2/ TJ | IPCC Guidelines 2006[18] |

[16] Baseline survey on energy consumption patterns and energy needs report for the GS-614 biogas project by SKGS. ,

[17] IPCC, Volume 2-Energy, Table 1.2

[18] IPCC, Volume 2-Energy,Table 1.4

| | | | |
|---|---|---|---|
| $LC_{T,h}$ | Number of animals or livestock of category T in household h | Buffalos - 1.04<br>Cows - 2,47<br>Other cattle – 2,35 | Survey undertaken by SKGS |
| $VS_T$ | Daily volatile solid excreted for livestock category *T*, kg dry matter. animal$^{-1}$ .day$^{-1}$ | Buffalos – 3,1<br>Dairy Cows - 3,8<br>Other Cattle – 1,4 | IPCC Guidelines 2006 and "Biogas Technology by BT Nijaguna, ISBN: 81-224-1380-3 Page: 29" |
| $GWP_{CH4}$ | Global Warming Potential (GWP) of methane, dimensionless | 21 | IPCC Guidelines 2006 |
| $Bo_T$ | Maximum methane producing capacity for manure produced by livestock category *T* , m$^3$CH4. kg$^{-1}$ of VS excreted | Buffalos – 0,10<br>Dairy Cows - 0,13<br>Other Cattle - 0,10 | IPCC Guidelines 2006 |

**ODA Funding and Public announcement:**
As per GS rules, ODA funding cannot be used to directly or indirectly purchase VERs as this is considered to be deviation of ODA funding. Therefore no ODA funding has been provided in the Arakalagudu biogas project activity. The GoodPlanet foundation based in Paris (France) has funded the project activity under the VER initiatives.
Also, no public announcement has been made in the last three years of the project going ahead without carbon revenues keeping in align with the Gold Standard rules and regulations.

**Consideration of the Carbon revenues:**

SKG has been working in the field of providing biodigester in the state of Karnataka with the help of the available Government Subsidies under the National Biogas and Manure Management programme (NBMMP)[19] or by available charity donors for the earlier biogas projects. But in the recent years the government subsidies have been drastically reduced per year for the entire country due to non-availability of enough national funds for expanding the national biogas programme. For example the allotments of biogas units for the state of Karnataka from the central government are given in the table below:

| Year | Allocated units for Karnataka state |
|---|---|
| 2005 – 2006 | 7500 units |
| 2007-2008 | 4000 units |
| 2009-2010 | 10000 units |

For the year 2005-2006 was targeted to construct around 7500 units[20] and for the year 2007-2008 it was reduced to 4000[21] out of which only 150 units were allocated for Hassan district[22], and the for the present year 2009-2010, the target is about 10000 units for the entire state. And according to SKGS the present needs of one district of Karnataka like Hassan district has a demand of around 50000 biogas units. SKGS had formulated the project in Arakalagudu

[19] http://mnes.nic.in/

[20] http://mnre.gov.in/annualreport/2005_2006_English/CH5/2.html

[21] http://www.methanetomarketsindia.com/sectors/agri.htm

[22] Government allocation order, dated- 02.01.08- reference given by providing the copy of the order on the registry. (The letter is in the local language and has been translated into English)

taluk for year 2007-2008 and found that the people cannot afford the units from their meager incomes. Understanding that it was not possible to get revenues from the Government for its biogas programme, SKGS contacted Good Planet by the end of the year 2007 and signed an agreement for the first GS micro-scale project activity on the 23/05/2008[23] under the voluntary market scheme, for construction of 516 units in the Arakalagudu Taluk of Hassan district, Karnataka. But since there has been an increasing demand from the neighboring villages for the biogas units and to continue to provide an renewable alternative to the local population the rural parts of the project area, SKG and Goodplanet Association have initiated a second project based on the GS VER micro-scale scheme for about 790 families. The contract for this project was agreed by both the participants and signed on the 15/12/2009.

**B.3. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered VER project activity:**

**A.) Description of the baseline scenario**

The beneficiaries in the project are dependent only on biomass for their daily needs for both cooking and heating water. And they do not use any fossil fuel and/or charcoal for their daily energy needs. Therefore comparing with the various baseline options given in the methodology, and as per section B.2, the baseline scenario is the pre-project situation with suppressed demand. The Baseline Option I (b) of the methodology has been applied since the survey has been carried out for a sample of the total population. The results of the baseline survey have been explained below to justify the baseline option of the 'pre-project scenario'. The baseline survey for the project activity was carried out in the month of January 2010.

The average annual income of beneficiaries is only 21,171 Rs (around 1700 Rs/month). Secondly, the annual income is generated from the agricultural activities, which if, affected due to disasters like droughts, or floods, or irregular rainfall patterns does affect the annual income of the family. Part of this income is also used for the expenditures of next cropping seasons, daily household needs, educating the children etc. Therefore most of the households depend on firewood, as it is cheaper than other energy sources. The average annual consumption of firewood for cooking needs is around 3,6 tons (10,12 Kg/day)[24]. The villagers collect dead wood in private lands, broken branches of a tree, and sometimes cut the whole trees in spite of the Forest Department ban on private trees cutting (except for trees in coffee plantations). As wood is getting scarcer, most households do not have enough land to sustain their firewood needs, and have to go further to gather wood. They gather wood from some areas under the Forest Department, which is prohibited. The distances they have to go over in order to collect wood are increasing, and can go up to 4 or 5 km. Moreover, since wood is scarce, families may not be able to collect themselves enough wood to cover their cooking needs, so most of the times they buy wood from the firewood retailers. These retailers generally collect wood illegally from forest areas and are one of the reasons for the growing deforestation in the project region. The consumptions given by the respondents were accurately measured with a weighing scale. Then, a correction factor was applied, in order to take into account that the firewood may be partly wet, even though it was measured in the dry season. It was assumed that in this season, the moisture content of the wood didn't exceed 5%.

On an average, a household has cattle of 2 Dairy cows, 1 buffaloes and 2 other cattle. Since the cattle are usually kept in a confinement near the house, the dung can be easily collected. Usually every house has an open pit near the cowshed. This pit is used to dump the cow dung and urine, agricultural residues, and kitchen waste of the houses. This pit is considered as a composting pit and is usually emptied once a year, generally in April before the monsoon season. Then the pit is filled again. The dung and agricultural residues are then stacked on the top of the pit, creating a windrow. The pit is never turned, and anaerobic conditions develop inside the pit, emitting large

[23] Agreement document between Goodplanet Association and SKGS.

[24] Baseline survey by SKG Sangha.

amounts of methane, particularly during the rainy season when the pit is always wet. According to the time of the year, the pit is in different states: 46% of the time it's uncovered slurry; 32% slurry with crust; and 15% solid material but wet. This compost generated out of the pit is spread on the agricultural lands as organic fertilisers. On an average, 88% of the dung is directly put in the pit, or collected from the field in order to put it in the pit. 12% is left into the field. The agricultural wastes are treated differently depending on their nature: Paddy and Ragi straw are dried and used as animal feed. However, part of this straw starts to decompose during the feeding, stocking, and is not eaten by the animals. This part is thrown into the composting pit with the animal dung and urine. Potato wastes and weeds are not useful for the farmers, and are thrown on the side of the field where they accumulate and decompose in shallow areas.

Households are also using fertilizers and pesticides for their own lands. From the annual report of Hassan district, the total amount of fertilisers use in the district is 79,840 tonnes and in Arakalagudu taluk the quantity used is 4312 tonnes during the annual year 2008-2009[25].

### B.) The project scenario

The project scenario is the situation where a total biogas plants would be built for about 790 beneficiaries.
Every household feeds their biodigester with the appropriate quantity of dung to meet their cooking energy needs. On average, 50kg of fresh cow dung, produced by 2 cows or buffalo, and 45L of wastewater is enough. A small part of the dung is left on the field, but most of it is collected. The dung that is not fed into the biodigester may be directly fed into the vermicompost unit. The biogas produced is used to meet cooking energy needs. Therefore, families do not have to use wood, except for big occasions such as religious festivals. Hence the project reduces the pressure on the forest. As the share of non-renewable wood is 53,90 %, more carbon will be stocked in woody biomass and by this way, it decreases anthropogenic emissions of GHG.

The vermicompost unit produces a natural fertilizer with the slurry that goes out the biodigester. At first the slurry is mixed with agricultural residues such as straw, maize residues etc. Then the first decomposition takes place in aerobic condition and lasts 25 days. During these 25 days, the mix is aerated at least every few days. Then, the mix is put into the vermicompost unit with worms. Worms digest it and produce vermicompost. In one day, one worm produces its weight of vermicompost. This part is named second decomposition and lasts at the beginning 40 days. The length of the second duration decreases as the number of worms grows exponentially. Vermicompost is partly used by beneficiaries for their own agricultural lands and partly sold.

### C.) Emission Reductions

The project reduces anthropogenic emissions thanks to two different processes.

- On the one hand, the project reduces emissions linked to cooking activities. In the baseline scenario, families are using firewood. As this firewood is partly non-renewable, there are GHG emissions from deforestation and degradation of the wooded areas.
- On the other hand, unmanaged animal dung emits methane, with a Global Warming Potential of 21 times superior to $CO_2$'s GWP. In the project scenario, the methane in the biogas is combusted and the remaining carbon dioxide, which is carbon neutral, will go into the atmosphere. Therefore, GHG emissions are avoided.

### D.) Additionality

[25] Hassan district at a glance 2008-2009, Pg 35.

The additionality is demonstrated using the latest version (version 5,2) of the "*Tool for the demonstration and assessment of additionality*" that is available on the UNFCCC website as required in the methodology. The assessment has been made from the perspective of the project coordinator implementing the project activity that is SKGS.

**Step 1. Identification of alternatives to the project activity**

***Sub-step 1a. Define alternatives to the project activity***
The following options are identified as alternative baseline scenarios:

A. The proposed project activity being carried out without GS VER registration.
B. Use of LPG or Kerosene.
C. Continuation of the current situation (no project activity or other alternatives undertaken).

Outcome of the step 1a: Identified realistic and credible alternative scenarios to the project activity –

Scenario A) – SKGS has been constructing the biogas plants for the last 15 years for the marginalized rural families who cannot afford the entire cost of a biogas plant. This was met with the help of the various external voluntary funding. This included all the associated cost like manpower, salaries, transportation and maintenance of these biogas plants. Therefore without the VER funding it would be not possible for SKGS to carry out the monitoring and maintenance on a regular interval for the project activity.

Scenario B – Even though the government provides subsidies for a limited amount of kerosene, the project beneficiaries will certainly not be able to totally depend on the use of kerosene as the project area lacks infrastructure and regular supply for a continuous distribution of either LPG or kerosene. Plus the project beneficiaries will not be able to afford the cost associated with LPG on a monthly basis as most their earning are based on the annual harvest from the agriculture produce.

Scenario C – due to the various barriers the continuation of the present situation is the realistic and credible alternative to the project activity.

***Sub-step 1b. Consistency with mandatory laws and regulations***
The above-mentioned alternatives are in compliance with all the mandatory applicable legislations and regulatory requirements except for the scenario C, which does not comply with the mandatory applicable legislation of India.

***Out come of Step 1b:***

Realistic and credible alternative scenarios for the project activity were identified like alternative A and B in compliance with the existing legislation of the country while alternative C being non complaint with the applicable legal requirement as the rule is not being enforced systematically in the rural areas of the country. Some of the rules from the Ministry of Law and Justice (Legislative Department) are as follows:

1. The State shall regard the raising of the level of nutrition and the standard of living of its people and the improvement of public health as among its primary duties".[26]
2. As per the article 48A - it is the duty of the state and every citizen to 'protect and improve the environment and to safeguard the forests and wildlife of the country'[27].

[26] "This information is downloaded from the website of Ministry of Law and Justice (Legislative Department)". The constitution of India, Part IV, Article 47, Page-22

[27] Reference uploaded on the registry 'The Constitution -42nd Amendment –( Pg 8)

3. There is mandatory compliance from the ministry of environment, India on the disposal of solid waste for industries using agricultural wastes[28] but there are no mandatory rules on the disposal of solid waste like the cow dung, kitchen waste for the rural communities.

Biomass alone currently meets 57% of the national energy demand, (Tata, 1998) yet is rarely featured in any 'official' statistics of energy use, given perhaps its scattered nature, and its low status as fuel[29] and in rural parts India, 90% of households burn biomass fuels in traditional cook stoves for domestic cooking[30]. Fuel wood is the primary source of biomass, derived from natural forests, plantations, woodlots and trees around the homestead (Agarwal, 1998). Therefore the only realistic alternative for the project beneficiaries are left is to continue using firewood from the nearby forest areas to meet their daily cooking energy needs. Karnataka is a southern state of India, whose economy is mainly dependent on the agriculture and therefore a large amount of crop residues, animal waste and domestic refuse are produced every year. They are either burned inefficiently as fuel or left unutilized to decompose naturally. In either case the rich carbon biomass is lost into air, thus polluting the atmosphere (Chowde Gowda and Chowdiah, 1993). The natural composting of crop residues, animal manure and human excreta deteriorates the living conditions of the rural population who already live in poor and badly drained houses. The wastes are dumped in heaps and left to rot a few metres away from the dwellings, attracting insects, releasing unpleasant odours and draining everywhere (Chowde Gowda & Chowdiah, 1994).[31].

It clearly shows that applicable legal or regulatory requirement for the improvement of the public health are not enforced and that non-compliance with the above requirement is widespread particularly in most of the rural areas of the country. Therefore, alternative C would have been continued in the absence of the project activity. Also, unlike the Solid waste management act (section 3, 6 and 25 of the Environment (Protection) Act, 1986 (29 of 1986)[32] for the urban part of the country they are not implied for the rural communities since the villages are under Panchayat, and the state gives the Panchayats the power to function as units of self-governments.[33]
Therefore, the project activity is the best available alternative to meet the daily energy needs of the project beneficiaries; it's an additional activity since it reduces the health effects by burning firewood in enclosed kitchen and assures a clean hygiene around the project area by using the cow dung and other wastes in the biogas plant.

In the continuation of the current situation, households collect wood in their own lands, but also in the forest areas, and other lands. The law forbids cutting wood in the government lands. However, the households are forced to collect wood from these lands in order to sustain their energy needs. It is common practice to collect wood from the forests, and as households are doing it now, they can continue doing so. The Baseline Scenario is therefore still a realistic scenario.

**Step 2. Investment analysis**

**This option has not been used. (Barrier analysis – step 3, has been demonstrated below).**

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[28] http://envfor.nic.in/legis/eia/gsr546(e).htm (page 7)

[29] http://www.ganesha.co.uk/Articles/Biogas%20Technology%20in%20India.htm

[30] Rural waste management in a south Indian village – a case study, M. Chowde Gowda

[31] Rural waste management in a south Indian village – a case study, M. Chowde Gowda.

[32] http://envfor.nic.in/legis/hsm/mswmhr.html

[33] "This information is downloaded from the website of Ministry of Law and Justice (Legislative Department)".As per the constitution of India, Part IV, Article 40, Page-22. (Every district is divided into Talukas and each Taluka is further divided into number of Panchayats and every Panchayat is responsible for certain number of villages)

**Step 3: Barrier analysis**

***Sub-step 3a: Identifying barriers that would prevent the implementation of the proposed project activity.***

a) **Investment Barrier:**
The total cost of one biogas plant and a vermicomposting unit in the project activity is more than Rs. 30,000[34] and whereas the annual income of the beneficiaries in the project area is around Rs. 21,000[35] Rs (around 1700 Rs/month). Therefore it's not financially possible for the beneficiaries to entirely invest in a biogas plant. Understanding the financial situations of the rural families, similar activity of implementation of biogas units in the rural parts have been initiated by the government of India since the 1981-1982, called as the National Project on Biogas Development. (And now known as National Biogas and Manure Management programme (NBMMP)). According to the government document, Karnataka state has a demand for 680000 and out of which only 396681 biogas units have been built (till 31/03/07)[36]. Also, according to SKGS, the government is not being able to provide anymore biogas plants due to lack of financial and infrastructure resources.

The fixed target for the year 2009-2010 is of 10000 plants for Karnataka state, while the remaining demand for the same state is assessed to be of 283319 households[37]. There is still a huge demand for biogas plants, and it cannot be satisfied only with the government subsidies. SKGS is also facing problems with the government of India administration: In 2002-2003, SKGS built 5600 biogas plants and asked the government agencies for the subsidies, but didn't get the subsidies that were promised. Ever since, SKGS members regularly visit the government agencies to claim for these subsidies, but with no success for the moment. For that reason, SKGS was not able to build biodigesters from 2004 to 2007. The government subsidies are not a reliable funding for the project and other funding are necessary.

b) **Technological Barrier:**
According to the wide experience of SKGS in construction of a biogas plants, the continuous working of a plant strongly depends on the accuracy of the construction with the help of very skilled workers. If the biogas plants are not constructed with the required specifications and measurements, there are chances that the biogas plants will stop working or will have continuous maintenance issues. To avoid this SKGS has to make sure that the people constructing the biogas plants are trained and well skilled. But it has been not easy to find trained and skilled workers to construct the biogas plant. Therefore, a continuous training programme is being conducted throughout the year for the workers to make sure there are no faults while constructing the biogas plants. This training programme has been an additional cost to the project for SKGS; but on the other hand, the NGO has been quite successful with the biogas plants. Therefore, SKGS continuously tries to find skilled people and who are willing to work in the rural areas of the project activity.

There has been a lack of infrastructure for implementation and logistics for the maintenance of the biogas plant. The workers have to be transported to rural areas, which is sometimes not very easy to access. The materials required for the construction of the plants have to be bought from distant places, increasing the cost of the project. To monitor the working of each plant, the staff has to travel long distances to each beneficiaries to check and if required address some technical issues related to the functioning of the biogas plant. If these regular visits to the project are not carried out then there are quite strong chances of technical failure risk for the non-functioning of the biogas plants. This is due to the fact that the beneficiaries have to

[34] Cost of biogas and a vermicomposting unit has been provided in the Annexes.

[35] As per the baseline survey carried out by SKGS.

[36] http://www.methanetomarketsindia.com/sectors/agri.htm

[37] Renewable energy for rural development, Annual report – 2007-2008 – (The report is uploaded on the GS registry)

be continuously informed about the requirement of the cow dung and water quantity in order to avoid any over feeding of waste and thus avoiding malfunctioning of the plant in the near future.

**c) Barriers due to prevailing practices:**

This project is not first of its kind, as SKGS and GoodPlanet Foundation, have already implemented a GS micro-scale biogas project (GS615) for only 516 families due to limited availability of funds. With the present project activity, 790 families will be provided with the biogas and vermicomposting units. According to the SKGS team, the demand in the district of Hassan itself is more than 50000 units.

The prevailing practice by the government in India is to make kerosene as cooking fuel available to the poor families through the public distribution system (PDS) at a subsidized price. A recent study shows that this subsidized kerosene does not reach the poor families as most of it diverted into the black market and sold at a higher price[38]. The study also states that about 38 % of the kerosene from the PDS is diverted into the black market and does not reach the intended recipients. In some states the diversion is high as 50 % or more. To solve these issues, the government has tried various options but till date the availability of kerosene to the rural people is difficult. In Karnataka, the rural population receives about 3 liters[39] of the subsidized kerosene, which leaves the families not enough fuel for lighting or cooking. This scarcity of essential commodities like fuels for the poor can, in turn, lead to civil unrest. Also, subsidies for the residential consumers of liquid petroleum gas (LPG) were also provided but the goal was not necessary to help the poor, as consumers of LPG have a higher income and can afford the initial capital investment of the stove and gas cylinder[40]. The capital cost of a $2m^3$ biogas plant is about 6 times the cost of LPG. (Annexes 6 – scanned copy of the LPG prices). The commonly and widely used wood fired stoves or ovens ("traditional mud stoves" or "improved vented mud stoves") cost around 5 Euros, a basic "3-rock stove" is zero.

Taking all this information into account, any of the new users who will be installing biogas plants under this project activity will be not able to afford a biogas plant. Even though, compared to the other options, it is in the long-term a cheaper, cleaner and locally and globally more beneficial technology. If the beneficiaries have to opt for a biogas unit over kerosene and firewood, they not only have financial barriers but also the present number of units allocated for biogas from the government is not sufficient for the entire district of Hassan. SKGS has already experienced the lack of sufficient funding under the NPBD programme. The implementation of the project activity would not have been possible without the carbon revenues through the voluntary market.

**Sub-step 3b:**

**Step 4. Common practice analysis**

At present the only other activities similar to the project activity is the National Biogas and Manure Management programme (NBMMP), which was started since 1981-1982[41]. With 74% of the total population

[38] Report for iisd-– Lessons learned from attempts to reform India's kerosene subsidy - Dr Bhamy Shenoy (Pg-6,7,8).

[39] http://www.hinduonnet.com/2010/04/29/stories/2010042954320400.htm (PDF version available on registry)

[40] Report for iisd-– Lessons learned from attempts to reform India's kerosene subsidy - Dr Bhamy Shenoy.(Pg1)

[41] http://mnes.nic.in/ (programmes/renewable energy for rural/family biogas plant scheme)*

of the country[42]live in the rural areas, it was not an easy task for the central government to implement biogas plants for every household in the rural villages to satisfy the minimum energy needs of a rural family. The following table gives a brief look at the total number of units that had been allocated from the annual year 2004-2005 till 2008-2009 through the NBMMP scheme and the target achieved during the annual year.

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| Year | Financial (Rs.in lakhs) | | Physical (No.of plants) | |
|---|---|---|---|---|
| | Target (S+C) | Achievement (S+C) | Target | Achievement (S+C) |
| 2004-05 | 737.50 | 300.00 | 12,500 | 6,418 |
| 2005-06 | 514.20 | 251.70 | 7,500 | 6,660 |
| 2006-07 | 414.20 | 330.20 | 4,000 | 3,336 |
| 2007-08 | 756.50 | 337.57 | 4,000 | 3,573 |
| 2008-09 | 645.29+120.00 * | 400.73 | 10,000 | 6,579 |

The table above gives the total number of units that have been allocated to the entire state of Karnataka through the NBMMP scheme, but there is no further information on how many units were later allocated to each district of the state. As mentioned earlier, Karnataka has about 31[43] districts, 175[44] taluks and which are further divided into villages. Therefore total number of biogas units that have been implemented through the NBMMP scheme by the stage government with the available target has been comparatively very less than the actual demand for biogas units at the village level. According to the information from SKGS, the number of units allocated to Hassan district in the year 2005-2006 was 500 units, for the year 2006-2007 was 200 units and for the year 2008-2009 was 200 units. These previous allocated number of units merely satisfies the demand for Hassan district. Despite being a common practice by the government to promote biogas units for the rural families, it could not satisfy the increasing demand in the state of Karnataka.

Secondly, one of the evaluation studies carried out in all the states of India, for the NBMMP project shows that out of the total biogas units that have been installed in the country only 45 % are fully functioning while 10 % are being used partially. The report also mentions that majority of the states failed to provide the information on the status of the units because the records were not maintained properly while only 6 were able to provide the details. The report also states that sufficient care was not taken at the time of construction to ensure the quality of the materials used, repairing of the plants has been found difficult by the owners as the technicians are not easily available or not well-equipped and lack proper knowledge, and also the non-availability of enough quantity of the animal dung lead to failure of the plants[45].

Emission reductions would not take place in the absence of the project activity, as the central government cannot provide anymore biogas plants to individual low-income families in the rural areas. The people would still continue to use wood as the cheapest mean for their daily energy needs. The cattle dung would not be collected efficiently as there would be a tendency to leave it for decaying aerobically or dry it and use for

[42] http://populationcommission.nic.in/facts2.htm

[43] http://www.karnataka.com/districts

[44] http://www.kar.nic.in/kla/karnataka.htm

[45] Report on the GS registry -Evaluation study on the National Project on Biogas Development. ( refer to page numbers: 9,38, 69, 74).

further heating needs. Whereas the project area is concerned, people's income does not make them to afford to buy LPG on a regular basis.

SKGS has been building biogas plants since its foundation in 1992, and has already achieved 45,000 biogas plants in four states of India.
The last biogas plants installed by SKGS were in 2002-2003, when they built 5,600 biodigesters. At that time, the plants were financed as followed:

- 30% by the National Biogas development program
- 40% by the Karnataka state subsidies
- 30% by the beneficiary in building material and man work since 2003, the Karnataka state subsidies have stopped and the National Biogas Development Program's target has dramatically decreased. Building biogas plants is not possible anymore with only government subsidies.

Moreover, the government has not given yet the subsidies for the biodigesters built by SKGS in 2002-2003, and cannot be considered as a reliable funding any more. This particular project has been able to be implemented since the neighboring beneficiaries have already witnessed successful biogas units in the region and are quite aware that the government cannot provide subsidized units on large-scale in this project area. Therefore they have been contacting SKGS to continue the implementation of more units in the neighboring regions as well. It is clear that the project needs the carbon revenues for the project to be implemented and carry out a regular monitoring, maintenance of the units to assure the continuous working of each unit implemented by SKGS in this project area.

Summary of the consideration of VER revenues for this project activity:-

| Date | Event | Documents provided on the GS registry |
|---|---|---|
| 06/03/2009 | Request from SKG Sangha to fund a second GS microscale project for about 1000 units in Arakalagudu taluk GS-VER microscale scheme. | Scanned copy of the emails exchanged between SKG Sangha and GoodPlanet Foundation, and marked as 'confidential' have been provided for the GS internal validation.<br><br>Reference document on the GS Registry: Confidential_Consideration_of_Second_GS_Microscale_SKG_GoodPlanet_Mail_Exchange |
| 15/12/2009 | Contract signed between SKG Sangha and GoodPlanet Foundation to fund the units in the Arakalagudu taluk. | Copy of the contract marked as 'confidential' has been provided to the GS for internal validation. |
| 03/01/2010 | Local stakeholder meeting carried out by SKG Sangha as per the GS rules. | GS-LSC document has been provided on the GS registry |
| 01/02/2010 (date of the first unit that has started functioning and were in regular use by the beneficiaries) | Agreement between the beneficiary, SKG Sangha and GoodPlanet Foundation. | Few scanned copies of the agreement marked as 'confidential' have been provided on the GS registry. This agreement is signed when the construction work begins and a second signature from the beneficiary is taken after the unit is completely functional. |
| 01/06/2011 | Expected date of completion of all the 790 biogas units. So far 505 units have been implemented and are functioning. | |

From the above points it's clear that the project activity is additional.

**B.4. Description of how the definition of the project boundary related to the baseline methodology selected is applied to the project activity:**

As per chapter I section II of the methodology, "*the physical, geographical site of the renewable energy generation delineates the project boundary".* Therefore, in the case of the project, the physical boundary is the Arakalagudu taluk of Hassan District as all the biodigesters will be built in this Taluk.

**Figure : Taluk Map of Hassan District**


According to the same chapter, the greenhouse Gases that could be included in the project boundary are listed in the table below:

| | Source | Gas | Included | Justification/ Explanation |
|---|---|---|---|---|
| Baseline | Thermal energy need | $CO_2$ | Yes | Major source of emission |
| | | $CH_4$ | No | Excluded for simplification, this is conservative |
| | | $N_20$ | No | Excluded for simplification, this is conservative |
| | Animal waste handling and storage | $CO_2$ | No | Excluded as CO2 emissions from animal waste are CO2 neutral |
| | | $CH_4$ | Yes | Major source of emission |
| | | $N_20$ | No | Excluded for simplification |
| Project Activity | Direct Emission from biodigesters | $CO_2$ | No | Excluded as CO2 emissions from biogas incineration are CO2 neutral |
| | | $CH_4$ | Yes | Emissions form physical leak or incomplete combustion of biogas |
| | | $N_2O$ | No | Excluded for simplification |

**B.5. Details of baseline information, including the date of completion of the baseline study and the name of person (s)/entity (ies) determining the baseline:**

**Date of completion:**
Non Renewable Biomass Study.
The non-renewable biomass study for the Hassan district was carried out with both the teams of GoodPlanet Foundation and the SKG Sangha team. The study was done in the year 2008 and was completed on the 31/04/2008.

Baseline survey for the project activity:
The baseline survey has been carried out by SKG Sangha in the month of February 2010. A sample of 144 beneficiaries was selected on a random basis during the baseline survey in the project area. The 144 samples include list of beneficiaries from all the villages in the project area.

The baseline is evolving since non-renewable biomass studies may be updated, and would require specific baseline study. SKGS would make these eventual updates of the baseline.

**Contact information:**

SKG Sangha (in Annex 1)
GoodPlanet / Action Carbone www.goodplanet.org / www.actioncarbone.org

## SECTION C. Duration of the project activity / Crediting period

### C.1 Duration of the project activity:

#### C.1.1. Starting date of the project activity:

10-01-2010 (agreement between Goodplanet and SKGS)

#### C.1.2. Expected operational lifetime of the project activity:

The lifetime of the biodigesters and vermicompost is not known exactly, but is greater than 20 years, since the first units installed by SKGS since the last 10 years are still functioning. The lifetime of the project is therefore more than 20 years.

### C.2 Choice of the crediting period and related information:

The project activity will use a fixed crediting period.

#### C.2.1. Renewable crediting period

**C.2.1.1. Starting date of the first crediting period:**
Not applicable

**C.2.1.2. Length of the first crediting period:**
Not applicable

#### C.2.2. Fixed crediting period:

**C.2.2.1. Starting date:**
01-04-2010
The project activity started its construction phase on the 1st of February 2010.
The construction of the 505 units started from the month of February and was completed by March. Since the units were constructed in different phases, the units were functional from mid-February for some beneficiaries and so far 505 units have been constructed and last unit that was checked to be functional was on 30th March 2010. Therefore the project will start claiming the credits from April 2010 for the 505 units that have been so far implemented.

The remaining units in the project activity will be completed in the year 2011. The database of the final completion of the total 790 units will be provided to the Gold Standard during each verification period of the project activity.

**C.2.2.2. Length:**
10 years

.

## SECTION D. Application of a monitoring methodology and plan

### D.1. Name and reference of approved monitoring methodology applied to the project activity:

The project uses the Gold Standard monitoring methodology specially designed for family-sized biogas plants "i*ndicative programme, baseline, and monitoring methodology for Small Scale Biodigester, Voluntary Gold Standard"*

### D.2. Justification of the choice of the methodology and why it is applicable to the project activity:

As per section B.1, the project activities fit under the conditions of application of the methodology.

## D.2. 1. OPTION 1: Monitoring of the emissions in the project scenario and the baseline scenario

### D.2.1.1. Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:

| ID number | Data variable | Source of data | Data unit | Measured, calculated or estimated | Recording frequency | Proportion of data to be monitored | How will the data be archived? (electronic/ paper) | Comment |
|---|---|---|---|---|---|---|---|---|
| *PE.1* | *Number of households in the project* | *Project activity database* | *Household* | *-* | *Once a year* | *-* | *Electronic (database)* | *The number of beneficiaries added in the project acitivity will be recorded and included in the annual monitoring survey report by SKGS.* |
| *PE.2* | *Number of households in the monitoring samples* | *Monitoring survey data* | *Household* | *-* | *Once a year* | *-* | *Electronic (database)* | *A monitoring survey will be conducted every year. .* |
| **Fuel Consumption emissions** | | | | | | | | |
| *PE.3* | *Project Household wood consumption* | *Survey* | *Kg of dry wood per season per household* | *Estimated* | *Once a year* | *Sample (144 households)* | *Electronic (database) Paper (questionnaires)* | *The wood consumption of every household of the sample will be weighted during survey.* |
| **Animal Waste and biodigester emissions** | | | | | | | | |
| *PE.4* | *Fraction of manure treated in animal waste management k* | *Survey* | *%* | *Estimated* | *Once a year* | *Sample (144 households)* | *Electronic (database) Paper (questionnaires)* | *Beneficiaries will be asked about their waste management practices during monitoring surveys.* |
| *PE.5* | *Number of heads of livestock category T* | *Survey* | *Animals* | *Estimated* | *Once a year* | *Sample (144 households)* | *Electronic (database) Paper (questionnaires)* | *The livestock of every household of the sample will be counted.* |
| *PE.6* | *GWP of methane* | *IPCC Guidelines* | *-* | *-* | *According to the IPCC's publications* | *-* | *-* | *As required by the methodology, IPCC values updates will be checked annually.* |
| **Failures** | | | | | | | | |
| *PE.7* | *Failures rate* | *Surveys.* | *%* | *Calculated* | *All the time* | *All the beneficiaries* | *Electronic (database)* | *In case of a failure, the beneficiary will contact SKGS in* |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | *order to solve it. Also, the team visits the beneficiaries at a regular internal of time and therefore if any failure of biogas units are observed are taken into account and recorded in the survey database. The date of the failure will be recorded, and the carbon credits adjusted.* |

**D.2.1.2. Data to be collected in order to monitor project performance on the most sensitive sustainable development indicators:**

| Sustainable Development Indicator | Data type | Data variable | Data unit | Measured, calculated or estimated |
|---|---|---|---|---|
| Soil Condition | - | Quantity of the vermicompost used annually. | Tons/yr | Estimated by a survey |
| Air Quality | - | Quantity of firewood | Tons/yr | Estimated during the Monitoring survey. |
| Livelihood of the poor | - | Change in living standards. Number of population who can access to effective waste management | - | Estimated during the Monitoring survey. |
| Access to affordable and clean energy services | - | Fraction of biodigester used | % | Estimated during the Monitoring survey. |
| Quality of Employment | - | If any temporary employment and/or additional income opportunity created through the vermicomposting part of the project activity, | | From SKGS database* |
| Human and institutional capacity | - | Total number of beneficiaries that had been part of any decision making process at the community, regional levels. | | From SKGS database |
| Technology transfer and technological self-reliance | - | Total number of training programmes for the supervisory staff of SKGS and for the beneficiaries. | | From SKGS data on training programmes. |

*SKGS Database:
SKG Sangha keeps a record regarding the total number of trainings that have been carried out during the year, if any change in employment both at regional and project level. This database will be used during the monitoring period to provide the available information for the some of the above mentioned SD indicators.

**D.2.1.3. Description of formulae used to estimate project emissions (for each gas, source, formulae/algorithm, emissions units of CO2 equ.)**

A monitoring plan will be followed as per the requirement of the methodology.

**Emissions from fuel consumption**

The emissions from the fuel consumptions are divided into two parts as per the given formula in the methodology:

Emissions from firewood consumptions
Emissions from Kerosene and/or LPG consumptions
Emissions from the animal waste management system.

The formula used to estimate the project estimations is as defined in the GS Small scale Biodigester methodology. The project emissions involve emission from household fuel consumption after installation of the biodigester and emission from the biodigester in the statistically significant sampling group. Emission from the biodigester includes physical leakage of the biodigester and incomplete combustion of biogas, which are both calculated as percentage of the produced methane.

$$PE_{y,h} = PE_{th,h,y} + PE_{biodigester,h,y}$$

Where:

$PE_{,y,,h}$ = Project emissions per household h in year y ($tCO_2e/yr$).
$PE_{,th,,h,y}$ = Project emissions from fuels used to meet the thermal energy need per household h in year y ($tCO_2e/yr$).
$PE_{,biodigester,,h,y}$ = Project emission from the biodigester per household h in year y ($tCO_2e/yr$).

$$PE_{th,h,y} = \left(\left(F_{i,pj,y}\right). NCV_i \,.\, EF_{CO2i}\right)$$

Where:
$PE_{,th,,h,y}$ = Project emissions from fuels used to meet the thermal energy need per household h in year y ($tCO_2e/yr$).
$F_{i,pj,y}$ = The total amount of fuel i in the project situation (mass or volume) per household in year y
$NCV_i$ = The net calorific value (energy content) per mass or volume unit of a fuel $i$,
$EF_{CO2,I}$ = The $CO_2$ emission factor per unit of energy of the fuel $i$.

For the assessment of EFCO2,i for $F_{i,pj,y}$ where $F_{i,pj,y}$ is a biomass source, the assessment of non-renewable biomass (NRB), as elaborated in the section on baseline emissions will be applied.

The physical leakage (PL) of the biodigester system is estimated using IPCC guidelines. The physical leakage from anaerobic digesters is estimated by the IPCC as 10% of total methane production. Where project participants use lower values or percentage of physical leakage, they should provide measurements proving that this lower value is appropriate for the project. Apart from leakage, also incomplete combustion results in the emission of methane to the atmosphere. This is accounted for by the inclusion of the combustion efficiency (η biogas stove) of the most commonly used type of biogas stove. This figure can be obtained form literature or a default value of 98% can be applied.

Project emissions will be determined for each household in the sample group. The mean of household project CO2 emission is calculated as follows:

$$\mu PE = \frac{\sum PE_h}{n_{pj}}$$

Where:

| | | |
|---|---|---|
| µPE | = | Mean of $CO_2$ emission of households included in the project sample group. |
| $PE_{,h}$ | = | The amount of $CO_2$ emission in household h included in the project sample group in the baseline situation. |
| $n_{pj}$ | = | Total number of households included in the project sample group. |

$$\sigma_{PE} = \sqrt{\frac{\sum \left(PE_h - \mu PE\right)^2}{n_{pj} - 1}}$$

Where:

| | | |
|---|---|---|
| $\sigma_{,PE,}$ | = | Standard deviation of $CO_2$ emission in the project situation. |
| µ$PE_{,}$ | = | Mean of $CO_2$ emission of households included in the project sample group. |
| $PE_{th}$ | = | The amount of $CO_2$ emission in household h included in the project sample group in the baseline situation. |
| $N_{pj}$ | = | Total number of households included in the project sample group. |

$$PE = n_{hh,y}\left(\mu_{PE} + z \cdot \frac{\sigma_{PE}}{\sqrt{n_{pj}}}\right)$$

Where:

| | | |
|---|---|---|
| PE | = | The total amount of $CO_2$ emission in the project situation. |
| $n_{hh,y}$ | = | Total number of households participating in the program for the monitoring interval y. |
| $\sigma_{PE,th}$ | = | Standard deviation of $CO_2$ emission in the project situation. |
| $\mu PE_{,}$ | = | Mean of $CO_2$ emission of households included in the project sample group. |
| $n_{bl}$ | = | Total number of households included in the project sample group. |
| z | = | Standard normal for a confidence level of 95% (1.96). |

**Waste Management Systems**

During the project, three waste management systems are likely to be found:

- Some of the dung is left on the filed and not managed at all.
- Most of the dung is fed into the biodigester.
- Some families do not need to feed all the collected dung into the biodigester to meet their cooking energy needs. In this case, they compost the balance of the dung more and above than the need of the biodigester directly in the vermicompost unit.

The animal waste management systems of the baseline situation could also be found, even if they are not likely.

| Manure Management System | MCF – 24°C (IPCC Guidelines 2006 – V4.Table10.17) | Definition of IPCC Manure Management System (Guidelines 2006 – V4.Table10.18) |
|---|---|---|
| Pasture | 1.5% | The manure from pasture and range grazing animals is allowed to lie as deposited, and is not managed. |
| Vermicomposting | 1.5% | Considered as Composting – passive windrow: "Composting in windrows with infrequent turning for mixing and aeration." *See explanations below* |
| Daily Spread | 0.5% | Manure is routinely removed from a confinement facility and is applied to cropland or pasture within 24 hours of excretion. |
| Burned for Fuel | 10% | The dung and urine are excreted on fields. The sun dried dung cakes are burned for fuel |
| Backyard Pit | 40.2% | *See explanations below* |

| | | |
|---|---|---|
| Biodigester | 100% | *Calculated separately* |

***Vermicompost management***

The vermicompost management system doesn't fit exactly in any of the IPCC Guideline Manure Management Systems. It will thus be described and related to the nearest IPCC manure management system.
The vermicompost management system takes place in two phases:

- At first, the dung or slurry is mixed with agricultural wastes and decomposed in a batch for 20-25 days. During this time, the mixture is turned at least 2 times a week in order to create aerobic conditions for the decomposition of the materials.
- The decomposed material can then be digested by the earthworms. The earthworms are added to a batch of around 400kg of decomposed material. Some of the worms go directly to the bottom of the batch, assuring aerobic conditions, while the other worms eat and digest the material, producing nutritious compost. Depending on the number of worms, this can take from 3 days to 45 days.

Since the decomposition and composting of the material takes place in aerobic conditions, with frequent turning, but less than every day, the nearest IPCC manure management system found was the "Composting, Passive Windrow".

***The Backyard Pit management system***

The backyard pit management system doesn't fit exactly in any of the IPCC Guideline Manure Management Systems. It will thus be described and related to the nearest IPCC manure management system. According to the time of the year, it corresponds to different management systems given by the IPCC: uncovered slurry (MCF = 60%), slurry with crust (MCF = 37%), and Solid material but wet (MCF = 4%). The baseline survey on waste management systems (reference number 6 on page 15) found out that the pit is an average between these 3 situations, and the equivalent MCF is 40.2%.

| **Manure Management System** | **MCF – 24°C (IPCC Guidelines 2006 – V4.Table10.17)** | **Definition of IPCC Manure Management System (Guidelines 2006 – V4.Table10.18)** |
|---|---|---|
| Solid storage | 4% | The storage of manure, typically for a period of several months, in unconfined piles or stacks. Manure is able to be stacked due to the presence of a sufficient amount of bedding material or loss of moisture by evaporation. |
| Slurry (without crust) | 60% | Manure is stored as excreted or with some minimal addition of water in either tanks or earthen ponds outside the animal housing, usually for periods less than one year. |
| Slurry (with crust) | 37% | Manure is stored as excreted or with some minimal addition of water in either tanks or earthen ponds outside the animal housing, usually for periods less than one year. |

| | | |
|---|---|---|
| Backyard Pit | 40.2% | Solid storage 2.3 months; Slurry with crust 4.7 months; and Slurry without crust 5.0 months. |

***Biodigester Management***

The methane conversion factor inside the biodigester is not known.
However, it is conservative to consider that all the dung is decomposed and thus:
$MCF_{biodigester} = 100\%$

**D.2.1.3. Relevant data necessary for determining the baseline of anthropogenic emissions by sources of GHGs within the project boundary and how such data will be collected and archived :**

| ID number | Data variable | Source of data | Data unit | Measured, calculated or estimated | Recording frequency | Proportion of data to be monitored | How will the data be archived? (electronic/ paper) | Comment |
|---|---|---|---|---|---|---|---|---|
| *PE.1* | *Number of households in the project* | *Project Database* | *Household* | - | *Twice a year* | - | *Electronic (database)* | *The number of beneficiaries in the project will increase as long as biodigesters are constructed.* |
| *BE.1* | *Number of households in the baseline samples* | *Surveys* | *Household* | - | *Once* | - | *Electronic (database)* | The Baseline may evolve in case a new area of Hassan district with sensible differences is identified. The original baseline will be then updated, representatively. |
| **Emissions from fuel consumption** | | | | | | | | |
| *BE.2* | *Baseline Household wood consumption* | *Survey* | *Kg of dry wood per season per household* | *Estimated* | *Once, and for every update of the baseline* | *Sample (144 households)* | *Electronic (database) Paper (questionnaires)* | - |
| **Emissions from waste management** | | | | | | | | |
| *BE.3* | *Fraction of manure treated in animal waste management k* | *Survey* | *%* | *Estimated* | *Once, and for every update of the baseline* | *Sample (144 households)* | *Electronic (database) Paper (questionnaires)* | *Beneficiaries will be asked about their waste management practices during the biannual survey* |
| *BE.4* | *Number of heads of livestock category T* | *survey* | *Animals* | *Estimated* | *Once, and for every update of the baseline* | *Sample (144 households)* | *Electronic (database) Paper (questionnaires)* | *The livestock of every household of the sample will be counted.* |
| *PE.6* | *GWP of methane* | *IPCC Guidelines* | - | - | *According to IPCC's publications* | - | - | *As required by the methodology, IPCC values updates will be checked annually.* |
| **Non Renewable Biomass** | | | | | | | | |
| *BE.5* | *NRB – Rate of the non renewable biomass* | *Study* | *%* | *Estimated* | *Once* | - | *Electronic (database) Paper (questionnaires* | - |

**D.2.1.4. Description of formulae used to estimate baseline emissions (for each gas, source, formulae/algorithm, emissions units of CO2 equ.)**

The GS small-scale biodigester methodology provided three options to carry out the baseline calculation for a project depending on the scenarios mentioned in the methodology. For this project, the option 1 has been selected and the formulas mentioned below to estimate the baseline emissions are as per the option 1 (pre-project situation).

The baseline emissions involve emission from use of fossil fuel and non-renewable biomass for cooking and heating, and emissions from the handling of animal waste in the baseline situation. In order to determine total baseline emissions, the baseline emissions per household are calculated as:

$$BE_h = BE_{th,h} + BE_{aw,h}$$

Where:
$BE_h$ = Baseline emissions of household h ($tCO_2e/yr$)
$BE_{th,h}$ = Baseline emissions from fuel consumption for thermal energy needs of household h ($tCO_2e/yr$)
$BE_{aw,h}$ = Baseline emissions from animal waste handling of household h ($tCO_2e/yr$)

**Baseline emissions from fuel consumption for thermal energy needs of household h.**
The baseline estimation from fuel consumption is calculated as per the below mentioned formulae and is adjusted for the share of non-renewable biomass. The non-renewable biomass for the project has been carried out as mentioned in the GS methodology. The Fossil fuel and biomass use has been determined through a survey in sample of the total population and the survey has been carried out before the implementation of the biodigesters for each beneficiaries.The calculation of baseline emissions is based on the results of the questionnaire. After collecting the questionnaires at all households included in the sample group, the mean and standard deviation of household project CO2 emissions from fuel consumption should be calculated. These variables will be inputs for calculating total CO2 emission from fuel consumption for the total number of households in the baseline situation as per formulas:

$$BE_{th,h,option1} = \Sigma\left(\left(F_{i,bl,h}\right) \cdot NCV_i \cdot EF_{CO2i}\right)$$

Where:
$BE_{th,h,\ option1}$ = The baseline emissions used to meet the thermal energy need of one household
$F_{i,bl,h}$ = The total amount of fuel i in the baseline situation (mass or volume) of one household
$NCV_i$ = The net calorific value (energy content) per mass or volume unit of a fuel *i*,

$EF_{CO2,i}$ = The CO2 emission factor per unit of energy of the fuel *i*.

The mean of the household baseline CO2 emissions is calculated as follows:-

$$\mu BE = \frac{\sum BE_h}{n_{bl}}$$

Where:

μBE = Mean of $CO_2$ emission of households included in the baseline sample group
$BE_h$ = The amount of $CO_2$ emission in household h included in the baseline sample group in the baseline situation
$n_{bl}$ = Total number of households included in the baseline sample group

The standard deviation of $CO_2$ emission in the baseline situation is calculated as follows:

$$\sigma_{BE,th} = \sqrt{\frac{\sum \left(BE_{th,h} - \mu BE_{th}\right)^2}{n_{bl} - 1}}$$

Where:

$\sigma_{BE,th}$ =Standard deviation of $CO_2$ emission in the baseline situation
$\mu Be_{th}$ = Mean of $CO_2$ emission of households included in the baseline sample group
$BE_{th,h}$ = The amount of $CO_2$ emission in household h included in the baseline sample group in the baseline situation
$n_{bl}$ = Total number of households included in the baseline sample group

The total $CO_2$ emission in the pre-project situation can then be calculated as follows:

$$BE = n_{hh,y}\left(\mu_{BE} - z \cdot \frac{\sigma_{BE}}{\sqrt{n_{bl}}}\right)$$

Where:

| | | |
|---|---|---|
| BE | = | The total amount of $CO_2$ emission in the pre-project situation |
| $n_{hh,y}$ | = | Total number of households participating in the program for the monitoring interval y |
| $\sigma_{BE}$ | = | Standard deviation of $CO_2$ emission in the baseline situation |
| $\mu_{BE}$ | = | Mean of $CO_2$ emission of households included in the baseline sample group |
| $n_{bl}$ | = | Total number of households included in the baseline sample group |
| z | = | Standard normal for a confidence level of 95% (1.96) |

**Baseline emissions from handling of animal waste:**

The baseline emissions from animal waste handling have been estimated using the IPCC TIER 1 approach (households with distinctive animal waste management systems where animals are kept in a confined area and the manure is collected following a specifically designed system). The formulae are:

$$BE_{aw,h,T2} = \sum_{T} \left( EF_{(T)} \cdot LC_{T,h} \right)$$

Where:

$BE_{aw,h,T2,}$ =the baseline emission from handling of animal waste for household h for TIER 2 in $tCO_2$ per year
$LC_{T,h}$ = Number of animals of livestock category Tin household h

$$EF_{(T)} = VS_{(T)} \cdot 365 \cdot GWP_{CH4} \left[ Bo_{(T)} \cdot 0.67 kg/m^3 \cdot \sum_{k} \frac{MCF_{BL,k}}{100} \cdot MS_{(T,k)} \right]$$

Where:

$EF_{(T)}$= annual $CH_4$ emission factor for livestock category *T*, $tCO_{2eq}$ $animal^{-1}$ $yr^{-1}$
$VS_{(T)}$= daily volatile solid excreted for livestock category *T*, kg dry matter $animal^{-1}$ $day^{-1}$

365= basis for calculating annual VS production, days $yr^{-1}$
$GWP_{CH4}$= Global Warming Potential (GWP) of methane
$Bo_{(T)}$= maximum methane producing capacity for manure produced by livestock category *T*, $m^3CH_4$ $kg^{-1}$of VS excreted
0.00067= conversion factor of $m^3$ $CH_4$ to tonne $CH_4$
$MCF_{(BL,k)}$ = methane conversion factors for the animal waste handling system in the baseline situation by climate zone *k*, %
$MS_{(T,S,k)}$= fraction of livestock category *T*'s manure treated in the animal waste management system, in climate region *k*, dimensionless

**D. 2.2. OPTION 2: Direct monitoring of emission reductions from the project activity (values should be consistent with those in section E).**

**D.2.2.1. Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:**

N/A

**D.2.2.2. Description of formulae used to calculate project emissions (for each gas, source, formulae/algorithm, emissions units of $CO_2$ equ.):**

N/A

**D.2.3. Treatment of leakage in the monitoring plan**

No significant sources of leakage are identified in the methodology.

**D.2.3.1. If applicable, please describe the data and information that will be collected in order to monitor leakage effects of the project activity**

| ID number *(Please use numbers to ease cross-referencing to table D.3)* | Data variable | Source of data | 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) | Comment |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

N/A

**D.2.3.2. Description of formulae used to estimate leakage (for each gas, source, formulae/algorithm, emissions units of $CO_2$ equ.)**

N/A

**D.2.4. Description of formulae used to estimate emission reductions for the project activity (for each gas, source, formulae/algorithm, emissions units of $CO_2$ equ.)**

The emission reductions are calculated as follow:

$$ER_y = (BE - PE_y) * Rfailures$$

Where

$ER_y$ = Total amount of emission reductions during the year y ($TCO_{2\,eq}$/year)
BE = Total amount of CO2 emission in the baseline situation ($TCO_{2\,eq}$/year)
$PE_y$ = Total amount of CO2 emission in the project situation during the year y ($TCO_{2\,eq}$/year)
Rfailures = Rate of failures (%)

$$Rfailures = \frac{Tfailures}{Ttotal}$$

Where

Rfailures = Rate of failures (%)
Tfailures = Cumulated time of failures over all the beneficiaries (days)
Ttotal = Cumulated time of the year over all the beneficiaries (days)

## D.3. Quality control (QC) and quality assurance (QA) procedures are being undertaken for data monitored

| Data *(Indicate table and ID number e.g. 3.-1.; 3.2.)* | Uncertainty level of data (High/Medium/Low) | Explain QA/QC procedures planned for these data, or why such procedures are not necessary. |
|---|---|---|
| *2.1.1 – 1 & 2* | *Low* | *The QA/QC for this point is not necessary as the project beneficiaries are selected as the application sent to SKGS. Therefore the total number of households in the project will be constant throughout the crediting period but SKGS will monitor this during the monitoring surveys and if due to any circumstances the number changes, it will be recorded and will be accordingly accounted for the ER calculations.*<br><br>*The number in the monitoring samples will be followed as per the guidelines for survey in the GS methodology on Biogas and will be followed throughout the crediting period of the project.* |

| | | |
|---|---|---|
| *2.1.1 – 4, 5, & 7* | *Medium* | *SKGS team is equipped with trained professionals who are aware the importance of the accurate data in order to assure the quality of the data. Apart from this SKGS have its local representatives in the villages who reports if there have any issues with any plants due to which the beneficiary had to use firewood for a prolonged period. Since the SKGS team has a regular visit to the beneficiaries, its possible for the team to keep record if there have been any changes in the mentioned parameter that are to be monitored. This also assures the quality of the data from the survey. Any changes observed by the SKGS team will be recorded and accordingly included during the ER calculations. In case of a failure, the beneficiary will warn SKGS in order to solve it. The date of the failure will be recorded, and the carbon credits adjusted.* |
| *2.1.1 – 6* | *Low* | *This parameter has been taken from the IPCC guidelines. As per the methodology guidelines, the IPCC value updates will checked annually and taken into considerations for the calculation if required.* |
| *2.1.1 – 1, 2, & 3* | *Medium* | *The sustainable development indicators will be monitored by the SKGS team and the data will be collected through the questionnaires and will be in recorded in a database. The data obtained from monitoring survey will be compared with any available government data and/or research studies to assure quality of the data.* |
| | | |
| | | |

**D.4. Please describe the operational and management structure that the project operator will implement in order to monitor emission reductions and any leakage effects, generated by the project activity**

**Maintenance of the biodigester**

SKGS will hire local coordinator among the villages where the project is implemented. They will work full time to:

- Gather the remarks and the needs of the beneficiaries on biogas and vermicompost;
- Assure maintenance operations that cannot be directly done by beneficiaries;
- Assure the link between SKGS and the beneficiaries.

Each coordinator will be responsible for a geographical zone of 5km round maximum. On average, a coordinator will be responsible for 4 or 5 villages and 200 beneficiaries. SKGS has already experienced the various issues that can be faced by the beneficiaries while using the biodigesters. Therefore from the past experiences, SKGS has designed a separate training programme both for its technical staff who are responsible to carry out the maintenance work and also for the beneficiaries. The training programmes are carried out once in year for the participants.

Since, its logistically difficult to carry out the training programmes for each and every beneficiary, in such cases, the trained technical staff of SKGS go and visit each and every household during the year to explain in detail about the minimum requirement of maintenance for a continuous supply of biogas and vermicompost production. Maintenance issues, which require the replacement of any hardware part, are usually carried out the SKSG team. All the contact details of both the supervisory/technical staff and the head office of SKGS are provided to the beneficiary. The training programmes are not only an awareness activity but also a knowledge sharing activity by between the participants and the SKGS team. The training programmes are free and do not include any additional charges to the participants.

**Monitoring of the Emission Reductions**

After the project implementation, a SKGS team will be staying in Project area.

A team of two SKGS members along with the help of the local volunteers, will lead the surveys in order to gather the necessary data for the monitoring. A random sample of 100 beneficiaries will be interviewed and asked for their fuel consumption and animal waste handling practices. The questionnaires will be sent to the main SKGS office where they will be encoded and analysed, in order to calculate the amount of emission reductions. The encoding will be made on a excel database..

The monitoring in the project activity is carried out by a three-tier system:

| | |
|---|---|
| First : | The units are regularly monitored by the SKGS field supervisors and the issues are reported to the SKGS head office. |
| Second : | A random check of the units is carried out by the SKGS managers to assure that the supervisors have been regularly carrying out the visit to the beneficiaries. Any issues if observed during this visit are immediately considered and the responsible supervisor is requested to solve it at the earliest. This is followed-up in the later weeks to assure that all observed issues have been resolved |
| Third : | An annual random check is carried out by the GoodPlanet staff to any of the units in the project activity to assure the continuous working of the units and recheck the total number of units that have been implemented during the year. |

| **D.5** | **Name of person/entity determining the monitoring methodology:** |
|---|---|

SKGS will be monitoring the project emissions. For contact information, see Annex 1.

## SECTION E. Estimation of GHG emissions by sources

### E.1. Estimate of GHG emissions by sources:

The households in the project areas have two stoves-

- One inside the Kitchen of the house for cooking purpose and,
- Second outside the house used for heating water.

It is assumed that there is no wood consumption for cooking purposes during the project. But to make sure that there is no increase use in the NRB in the region due the the project activity, the monitoring survey to be carried out by SKGS will include the non-beneficiaries in the project area. This would help to compare and keep a check if there has been any increase in the NRB consumption by the project activity and if any such increase is noticed, it will be accounted and included as project emissions other than the animal waste management and leakages of the biodigesters. The monitoring survey will also include if the project beneficiaries have switched back to wood consumption due to any technical problems for the non-functioning of the biogas unit. This will be included in the project emissions as well to keep a check on the possibilities of the rebound effect in the project area.

The average household emissions are of 0.44 $TCO_2$ eq/yr/biodigester and the standard deviation is 0.22 $TCO_2$ eq/yr/biodigester, for a sample of 144 households.
As per formula of B.2.1, the project emissions for the 790 biodigesters are thus of 379 $TCO_2$ eq/year.

### E.2. Estimated leakage:

There is no identified leakage.

### E.3. The sum of E.1 and E.2 representing the project activity emissions:

The project activity emissions are of 379 TCO2eq/year.

### E.4. Estimated anthropogenic emissions by sources of greenhouse gases of the baseline:

**Fuel Consumption Emissions**
The average household emissions from fuel consumption are 3.34 $TCO_2$ eq/yr/HH.
The sample was constituted of 144 households. The standard deviation on the sample is 1.24 $TCO_2$ eq/yr/HH.

**Animal Waste Emissions**
The average household emissions from animal waste management are 3.46 $TCO_2$ eq/yr/HH.

The sample was constituted of 144 households. The standard deviation on the sample is 1.86 $TCO_2$ eq/yr/HH.

**Total Baseline Emissions**
As per formula (9) of D.2.1.2, the total baseline emissions for 790 untis are 5367 $TCO_2$ eq/yr.

## E.5. Difference between E.4 and E.3 representing the emission reductions of the project activity:

The average emission reductions of the project activity for 790 units are 4674 TCO2eq/yr.

## E.6. Table providing values obtained when applying formulae above:

| Year | Estimation of Baseline emission reductions (tonnes $CO_2$ e) | Estimation of project activity emission reduction (tonnes CO2 e) | Estimation of leakage (tonnes $CO_2$ e) | Estimation of emission reductions (tonnes $CO_2$ e) |
|---|---|---|---|---|
| 2010 (from 01/04/2010) | 2573 | 182 | 0 | 2392 |
| 2011 | 3431 | 242 | 0 | 3189 |
| 2012 | 5367 | 379 | 0 | 4989 |
| 2013 | 5367 | 379 | 0 | 4989 |
| 2014 | 5367 | 379 | 0 | 4989 |
| 2015 | 5367 | 379 | 0 | 4989 |
| 2016 | 5367 | 379 | 0 | 4989 |
| 2017 | 5367 | 379 | 0 | 4989 |
| 2018 | 5367 | 379 | 0 | 4989 |
| 2019-2020 (till 31/03/2020) | 6709 | 473 | 0 | 6236 |
| **Total** | 53670 | 3790 | 0 | 46736 |

A total of 505 units have been implemented in the year 2010 and have been considered to claim credits from the month of April 2010. Therefore the Emission Reductions (ER) for the year 2010 has been considered from April to December 2010 (9 months). For the year 2011, though a total 790 units would be completed as per the allocated target for this project, for the moment the ER have been calculated considering 505 units. The actual ER's generated during the year 2011, will be updated as per the total number of units installed in the project activity. The following years from 2012 onwards the ER's have been calculated for a total of 790 units.

# SECTION F. Environmental impacts

**F.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:**

No Environmental Impact Assessment (EIA) has been performed for the proposed VER project activity, for the following reasons:

1. The project being a renewable energy biomass project, it does not fall under the purview of the Environmental Impact Assessment (EIA) notification of the Ministry of Environment and Forest, Government of India. As per the Government of India Environmental Impact Assessment Notification dated of 14/09/2006[46], pubic hearing and EIA is required for those industries/projects which are listed in the predefined list of ministry of environment and forest. This type of project is not included in the list. Hence, an EIA is not required by the host party.

2. The Sustainable Indicator Matrix, as shown in section A.2 in this PDD must be subject to the EIA pre-screen checklist to determine the necessity of an EIA. Please see A.2 for the Sustainable Indicator Matrix, the scores and the explanations of the scores.

3. The outcomes Stakeholder Consultation did not raise any comments on significant impacts of the proposed project on the environment. In order to ensure adequate consideration of a full range of issues, a stakeholder feedback round is being carried out as per the Gold Standard requirement. The comments received during this feed-back round will be included in the respective documents and a revised version of the documents will be accordingly uploaded on the GS registry.

**F.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:**

N/A

[46] http://envfor.nic.in/legis/eia/so1533.pdf

## SECTION G. Stakeholders' comments

### G.1. Brief description how comments by local stakeholders have been invited and compiled:

The local stakeholders are immediately affected by the activities of the project. The effect is on the local environment, social life and economics. All the individuals and organizations falling in the above effects are perceived as stakeholders. They can be within the boundaries of the villages, the district, state or nation.
On deciding above criteria for qualification of the stakeholders, the following stakeholders were identified:

- Beneficiaries of the project. As SKGS has already implemented similar biogas and vermicompost projects, it is possible to interview beneficiaries of these old projects.
- Future beneficiaries of the project.
- Employees of SKGS
- Local NGOs
- Office bearers of the villages local bodies
- Authorities of the district and local administration

The following NGOs who are Gold Standard supporters were also identified as stakeholders:

- Carbon Watch - India
- CDM Finance - India
- Development Alternatives Group - India
- EnerGHG India
- Winrock International India
- Greenpeace India Climate and Energy Campaigner
- WWF India

As the panel of stakeholders is very large, from villagers of remote rural areas, to district authorities and national NGOs, and the transportation times are long, it was decided to conduct several meetings so that every stakeholder could be met and express its comments.

At first, consultations of the villagers, beneficiaries of the project, and future beneficiaries of the project were conducted:

On 03/01/2010, a first consultation of the villagers was held in Kallumuddanahalli village, Arakalagudu Taluk, Hassan District of Karnataka State at 11.00 am. As SKGS had already build biogas plants in the neighboring villages, the association was well known Villagers were invited in advance either bythe SKGS local coordinator and/or by post. Locally elected Panchayat members (an Indian administrative division gathering around 10 villages) were also invited, as well as local NGO members. A total of 144 persons attended this stakeholder meeting.

- A second stakeholder consultation will be held during the validation phase of the project activity.

Some of the comments received by the stakeholders have been mentioned below:

| Stakeholder Comment | Assessment | Response to comment |
|---|---|---|
| Why do you consider a minimum requirement of 3 cows/buffaloes with the family? | Technical issues | To produce the biogas, it requires a continuous feed of cow dung on a regular basis. Therefore a family should have minimum number of cows to make sure the availability of the cow dung and a regular production of the biogas. |
| Why SKGS does not implement this project on a large scale? | Financial issues | SKGS would be very happy to implement the biogas project on a large scale but it is restricted due to the available financial resource. For this particular project SKG Sangha has received a limited amount of funding from GoodPlanet.org, under the voluntary carbon market scheme. |
| How to carry out the maintenance of the biogas plant? | Technical issues | The SKGS field team performs a regular monitoring work of each biogas plant throughout the year to make sure it's in a good working condition. Otherwise the family can contact the organization if faced with any technical issues of the biogas. |
| How does the biogas reduce the pollution? | Environmental issues | The biogas plant needs cow-dung to produce the gas. If the cow-dung is not utilized by the plant, it is discarded on an open field, which leads to emissions of methane gas. Methane gas is one of the harmful gases, which pollute the environment. The biogas plant helps to stop the methane pollution by using the cow-dung in the production of the gas. |

A complete details of the stakeholder meetings have been compiled in the GS Stakeholder document that has been separately submitted to the Gold Standard for further reference.

## G.2. Summary of the comments received:

The report of the stakeholder consultations have been uploaded on the GS registry for further reference.

The outcomes of stakeholder meeting were very positive. It appeared that biogas is a well known technology, and that the demand for this technology is very high. During consultations, people were asking insistently for the project to be implemented in their village. Even if vermicompost is a new technology, people were aware of its benefits. The project is therefore welcomed by the beneficiaries, the local authorities and the local NGOs.

| SL. NO | NAME | Your opinion about this meeting | what you liked in the project | what you did not like in the project |
|---|---|---|---|---|
| 1 | Girisha Mr | Very Informative | Project Provides Good Organic Manure And Scientific Knowledge | Nothing. Everything Is Good |
| 2 | Marulappa Km | It Is Very Much Useful To Farmers | Vermi Compost Is Much Useful To Farmers, Earthworms Are Friends Of Farmers | Nothing |
| 3 | Jayakumar Hd | Conducting This Programme In Every Villege Is Useful To Farmers | Time Saving, Good Earthworms | Nothing |
| 4 | Annaiah | Needed Information Has Been Given To Village People | Easy Way Of Producing Cooking Gas | Liked Everything |
| 5 | Somashekara Ms | Well Orgsanised And Very Informative | Continuation Of Biogas Project | Make It Compulsary To Procure Good Bricks.*** |
| 6 | Manu Ns | Verymuch Useful | Vermicompost | Nothing |
| 7 | Byregowda | The Information Reguarding Vermicompost To The Farmers Is Appriciated | Information About Biogas And Vermicompost Is Verymuch Useful To Farmers | Nothing |
| 8 | Sathish Md | Learned Many Things | Vermicomposting | Nothing |
| 9 | Ravikumar Ms | Information Provided Reguarding Easy Way Of Producing Gas | Cooking On Biogas And Producing Good Compost | Nothing |
| 10 | Yogesh Nb | Learned About The Usefulness Of The Two Components | Producing Biogas And Vermi Compost | Nothing |

| | | | | |
|---|---|---|---|---|
| 11 | Mahesh | Organising This Kind Of Meetings Will Facilitate The Stake Holders To Understand Each Other | All Components Of The Project | Nothing |
| 12 | Channakeshava Dc | Farmers Are Very Much Interested | Vermicompost Unit | Nothing |
| 13 | Channakeshava Murthy | Farmers Are Get Benifited From This Project | Farmers Are Benifitted From This Project | Nothing |
| 14 | Swamy Gowda Km | By The Useage Of Biogas We Can Save The Forest | Vermicompost From Biogas Slurry Is Easy | Nothing |
| 15 | Devaraju Ar | Vermicompost Unit Was Very Useful | We Can Save Environment And Also Can Reduce Firewood | Nothing |

*** The comment by the stakeholder 'number 5' was of significant importance that was explained in detail by SKGS to the other stakeholders as well. The suggestion made by this stakeholder was that SKGS should make an obligatory process for each and every beneficiary to procure good bricks. In the earlier biogas projects carried out, the bricks utilized by the beneficiary were bought at a cheaper price to avoid high cost and this was not monitored by the implementing agencies. Due to use of the low quality of bricks lead to malfunctioning of the biogas units and some them had stopped working. SKGS is already aware of these issues and therefore it has taken the initiative to buy the bricks rather than asking the beneficiary to buy it. Most of the materials used for the biodigester construction is bought by SKGS themselves. This is one of the ways through which SKGS assure that good quality of materials are used during the construction phase to avoid any failures or malfunctioning of the units in the near future.

A detailed list of comments has been provided in the GS LSC document and has been uploaded on the GS registry.

**Internet consultation**
No comments have been received.

## G.3. Report on how due account was taken of any comments received:

Since no negative comments were received, no action has been undertaken.

Annex 1

## CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

| | |
|---|---|
| Organization: | SKG Sangha |
| Street/P.O.Box: | H.No. 532, 2nd Main Road, Gandhi Nagar |
| Building: | |
| City: | KOLAR |
| State/Region: | Karnataka State |
| Postfix/ZIP: | Postal Code – 563 101 |
| Country: | INDIA |
| Telephone: | +91 8152 225370 |
| FAX: | +91 8152 224146 |
| E-Mail: | skgsangha@gmail.com |
| URL: | http://www.skgsangha.org/ |
| Represented by: | Vidya Sagar Devabhaktuni |
| Title: | President |
| Salutation: | Mr. |
| Last Name: | Devabhaktuni |
| Middle Name: | |
| First Name: | Vidya Sagar |
| Department: | |
| Mobile: | +91-9243436266 or +91 9844160038 |
| Direct FAX: | |
| Direct tel: | |
| Personal E-Mail: | president@skgsangha.org |

Annex 2

## BASELINE INFORMATION

| Name | Description | Value | Source |
|---|---|---|---|
| **Animal Waste Management Data** | | | |
| $\mu LC_{buffalo}$ | Mean number of buffalos in baseline sample group | 1.04 Animals /household | Baseline Survey on Waste Management Systems[47] |
| $\mu LC_{cow}$ | Mean number of cows in baseline sample group (included in other cattle for the calculations) | 2.4 Animals /household | Baseline Survey on Waste Management Systems |
| $\mu LC_{Other\text{-}cattle}$ | Mean number of Other cattle in baseline sample group | 2.3 Animals /household | Baseline Survey on Waste Management Systems |
| $VS_{buffalo}$ | Daily volatile solid excreted by a buffalo | 3.1 Kg $_{dry\ matter}$. animal$^{-1}$ .day$^{-}$ | IPCC Guidelines 2006 - V4.T10A-6 |
| $VS_{dairy\ cow}$ | Daily volatile solid excreted by a dairy cow | 3.8 Kg $_{dry\ matter}$. animal$^{-1}$ .day$^{-1}$ | Biogas Technology by BT Nijaguna, ISBN: 81-224-1380-3 Page: 29 |
| $VS_{Other\ cattle}$ | Daily volatile solid excreted by a dairy cow | 1.4 Kg $_{dry\ matter}$. animal$^{-1}$ .day$^{-1}$ | IPCC Guidelines 2006 - V4.T10A-4 |
| $Bo_{cow}$ | Maximum methane producing capacity for manure produced by a dairy cow | 0.13 $m^3_{CH4}$. kg$^{-1}$ of VS excreted | IPCC Guidelines 2006 - V4.T10A-4 |
| $Bo_{buffalo}$ | Maximum methane producing capacity for manure produced by a buffalo | 0.10 $m^3_{CH4}$. kg$^{-1}$ of VS excreted | IPCC Guidelines 2006 - V4.T10A-6 |
| $Bo_{Other\ cattle}$ | Maximum methane producing capacity for manure produced by a Other cattle | 0.10 $m^3_{CH4}$. kg$^{-1}$ of VS excreted | IPCC Guidelines 2006 - V4.T10A-6 |

[47] The references are given on page 50.

| | | | |
|---|---|---|---|
| $GWP_{CH4}$ | Global Warming Potential (GWP) of methane, dimensionless | 21 | IPCC Assessment report on Physical Science Basis of Climate Change 2007 & IPCC Guidelines 2006 |
| $MCF_{backyard\ pit}$ | Methane conversion factor for the animal waste management : backyard pit (24°C mean temp) | 40.2 % | Calculated (See section D.2.1.3) |
| $MS_{pasture}$ | fraction of manure treated in the animal waste management system : pasture | 12 % | Baseline Survey on Waste Management Systems |
| $MS_{burned\ for\ fuel}$ | fraction of manure treated in the animal waste management system : burned for fuel | 0 % | Baseline Survey on Waste Management Systems |
| $MS_{backyard\ pit}$ | fraction of manure treated in the animal waste management system : backyard pit | 88 % | Baseline Survey on Waste Management Systems |

| **Fuel Consumption Data** | | | |
|---|---|---|---|
| $\mu FC_{firewood}$ | Mean wood consumption for cooking purposes of beneficiaries before the implementation of biodigesters | 3,6 Twood/yr | Baseline Survey on energy needs and consumptions |
| $MC_{firewood}$ | Moisture content of the firewood at the time of the survey (dry season) | 5% | Estimated. |
| NRB | Non renewability rate of firewood in Hassan District | 53.90 % | Baseline Survey on the Renewability of the Biomass in Hassan |
| $NCV_{firewood}$ | Net calorific value of wood | 15,6 TJ/Gg | IPCC Guidelines 2006 - V2-T1.2 |
| $EF_{firewood}$ | Emission factor of wood for CO2, tonsCO2.$TJ^{-1}$ | 112 $TCO_2/TJ$ | IPCC Guidelines 2006 - V2-T1.4 |

| **Socio-Economic Indicators** | | | |
|---|---|---|---|
| µIncome | Average income of the beneficiaries before the implementation of the project | 21,000 Rs/yr | Baseline Survey |

| | | | |
|---|---|---|---|
| µTime | Average time spend on collecting wood before the implementation of the project | 7 Days/yr | Baseline Survey |
| µCF | Average quantity of fertilizer used per acre before the implementation of the project | 191 Kg/acre | Baseline Survey on energy needs and consumptions |

The Baseline Survey was carried out by the SKGS local staff in the January 2010.
The Baseline Study on the Renewability of the biomass in Hassan district was been conducted in March and April 2008 for the first GS biogas project (GS615) in the Hassan district. The report of these surveys and studies are available on GS registry website.

Annex 3

## MONITORING PLAN

As per Section III of the *Indicative programme, baseline, and monitoring methodology for Small Scale Biodigester, Voluntary Gold Standard* and in application of the baseline option n°1, 12 parameters are to be monitored.
However, the formula to calculate Project Emissions has been slightly modified:

- The Project Emissions will be calculated once a year, in order to take into account the changes in Fuel consumption.
- As all the dung is not fed into the biodigester, emissions from dung treated under other waste management system will be calculated.

**Box n°1: Data and parameters monitored.**

*Data and parameters monitored as per methodology*

| **Data / Parameter:** | **ID 5 / $n_{hh.y}$** |
|---|---|
| Data unit: | [-] |
| Description | Total number of households participating in the programme in year y |
| Source of data: | SKGS Database with all the details of the beneficiaries. |
| Measurement procedures (if any): | All households' details with their allocated serial numbers, are included in the database. The total number of households is derived from this database. |
| Monitoring frequency: | Annually |
| QA/QC procedures: | The data will be also cross checked by the GoodPlanet team who will carry out a random visit to the units of the project acitivty to ensure that the data provided corresponds to the field observations made by the GoodPlanet team. |
| Any comment: | A separate database is maintained by SKG Sangha which contains all the details of each beneficiary in the project activity. |

| | |
|---|---|
| | Each household is allocated a serial number by SKGS to avoid any double counting.<br>Any additions of new beneficiaries will be updated in the database and a detailed database will be provided during the verification process of the project activity. |

| **Data / Parameter:** | **ID 8 / $F_{i,y,pj}$** |
|---|---|
| Data unit: | kg or $m^3$ |
| Description | amount of fuel I consumption in the project in year y |
| Source of data: | Annual monitoring Survey. |
| Measurement procedures (if any): | During the survey, the monitoring team will ask each beneficiary in the survey sample about the average firewood consumed per day after the implementation of the project activity. This will be further calculated for the annual consumption. |
| Monitoring frequency: | Annually |
| QA/QC procedures: | To assure that the beneficiary gives a correct data, the monitoring team will weigh the firewood using the weighing machine, to record the accurate data.<br><br>To assure the quality of the data, two SKGS senior staff members who have been trained will carry out the monitoring survey. |
| Any comment: | The monitoring survey will be carried out by selecting the beneficiaries on a random basis from the database of the project.<br><br>The data will be cross checked by the GoodPlanet team who will also carry out a random visit to the units of the project activity to ensure that the data provided corresponds to the field observations made by the GoodPlanet team. |

| **Data / Parameter:** | **ID 9 / I** |
|---|---|
| Data unit: | tons/year |
| Description | Annual biomass increment on the project area$_i$. |
| Source of data: | Obtained from field surveys, GIS, or from governmental data. |
| Measurement procedures (if any): | The measurement for this study will be taken from the latest published state data on the forest cover and the available various research data. Data of the parameters, which are not available, will be procured by carrying out a local survey by the team. |
| Monitoring frequency: | Annually |
| QA/QC procedures: | **The team will use the latest available document either from the state agencies and the academic institutions to assure the revisions.** |
| Any comment: | If there are any large-scale deforestation or afforestation projects undertaken in the area, this will be taken into account for the parameters and the respective figures will be revised in all the concerned documents. |

| **Data / Parameter:** | **ID 10 / H** |
|---|---|
| Data unit: | tons/year |
| Description | Annual biomass harvest on the project area$_i$. |
| Source of data: | Obtained from field surveys, or governmental data. |
| Measurement procedures (if any): | The measurement for this study will be taken from the latest published state data on the forest cover and the available various research data. Data of the parameters, which are not available, will be procured by carrying out a local survey by the team. |
| Monitoring frequency: | Annually |
| QA/QC procedures: | **To assure that the beneficiary gives a correct data, the monitoring team will weigh the firewood using the weighing machine, to record the accurate data.** |
| Any comment: | If there are any large-scale deforestation or afforestation projects undertaken in the area, this will be taken into account for the parameters and the respective figures will be revised in all the concerned documents. |

| **Data / Parameter:** | **ID 11/ $MS_{(T,biodigester,k)}$** |
|---|---|
| Data unit: | [-] % |
| Description | Fraction of livestock category *T*'s manure fed into the biodigester, *S* |
| Source of data: | Annual monitoring Survey |
| Measurement procedures (if any): | |
| Monitoring frequency: | Annually |
| QA/QC procedures: | To assure the quality of the data, two SKGS senior staff members who have been trained will carry out the monitoring survey. |
| Any comment: | The monitoring survey will be carried out by selecting the beneficiaries on a random basis from the database of the project.<br><br>The data will be cross checked by the GoodPlanet team who will also carry out a random visit to the units of the project activity to ensure that the data provided corresponds to the field observations made by the GoodPlanet team. |
| | |

| **Data / Parameter:** | **ID 12 / PL** |
|---|---|
| Data unit: | [-] % |
| Description | Physical Leakage of the biodigester |
| Source of data: | Default values of 10%.from the 2006 IPCC Guidelines for National Greenhouse Gas Inventories are taken into account. |
| Measurement procedures (if any): | |
| Monitoring frequency: | Annually |
| QA/QC procedures: | |
| Any comment: | If any changes in the IPCC guidelines are observed for this parameter, the necessary documents will be revised. |

| **Data / Parameter:** | **ID 13 / LC** |
|---|---|
| Data unit: | [-] |
| Description | Number of life stock of category K |

| | |
|---|---|
| Source of data: | Annual Monitoring Survey |
| Measurement procedures (if any): | The monitoring team will check onsite while visiting the beneficiaries during the monitoring surveys. |
| Monitoring frequency: | Annually |
| QA/QC procedures: | To assure the quality of the data, two SKGS senior staff members who have been trained will carry out the monitoring survey. |
| Any comment: | The monitoring survey will be carried out by selecting the beneficiaries on a random basis from the database of the project.<br><br>The data will be cross checked by the GoodPlanet team who will also carry out a random visit to the units of the project activity to ensure that the data provided corresponds to the field observations made by the GoodPlanet team. |

| **Data / Parameter:** | **ID 16 / $GWP_{CH4}$** |
|---|---|
| Data unit: | $tCO_2e$ / t $CH_4$ |
| Description | Global Warming Potential (GWP) of methane |
| Source of data: | Most recent IPCC guidelines |
| Measurement procedures (if any): | - |
| Monitoring frequency: | Annually |
| QA/QC procedures: | **-** |
| Any comment: | - |

*Data and parameters to be monitored, in order to take into account specificities of the project*

| **Data / Parameter:** | **ID 17 / $MS_{S,T,h,p}$** |
|---|---|
| Data unit: | [-]% |
| Description | Fraction of livestock category *T*'s manure not fed into the biodigester and treated according to the animal waste management S.. |
| Source of data: | Annual Monitoring Survey |
| Measurement procedures (if any): | This will be measured by asking each beneficiary in the |

| | |
|---|---|
| | monitoring survey to total amount of animal dung collected from the shed and fields. The amount of dung fed to the digester and the amount left in the open pits. |
| Monitoring frequency: | Annually |
| QA/QC procedures: | The quality of the data will be assured by weighing on an average amount of dung that is being collected by the beneficiaries during the monitoring surveys.<br><br>To assure the quality of the data, two SKGS senior staff members who have been trained will carry out the monitoring survey. |
| Any comment: | The monitoring survey will be carried out by selecting the beneficiaries on a random basis from the database of the project.<br><br>The data will be cross checked by the GoodPlanet team who will also carry out a random visit to the units of the project activity to ensure that the data provided corresponds to the field observations made by the GoodPlanet team. |

## Monitoring Survey

In order to monitor the project, SKGS will conduct a survey of the beneficiaries in the project. This survey will be once a year.

The monitoring survey will also check if biogas is used for cooking and space heating as prescribed in Section III of the methodology.
Sustainable development indicators will also be monitored during this survey:

***Selection of the sample***
A sample of more than100 beneficiaries will be targeted for each survey. This number allows a good accuracy in the assessment of fuel consumptions and waste management systems.
As specified by the methodology, the sample should be chosen randomly. Though, as the project is spread on a wide area, transportation time and people availability makes it difficult to survey a random sample.

For each survey, a random selection of villages will be visited.

***Questionnaires***
The questionnaire of the survey has been realized by SKGS and GoodPlanet after the baseline survey.

***Realization of the survey***
is The team of SKGS is well trained to carry out such surveys from their past experiences in the first GS micro scale project. Therefore the required surveys in the project activity will be carried out by the same experienced team of SKGS and if needed GoodPlanet will provide the necessary guidance and support during the survey.

The survey will be done by members of SKGS. They know perfectly:

- Regional customs;
- Local farming practices;
- The technical design of the biodigester system;
- The amount and type of fuel used for each household; and
- How households handle their animal waste.

The compliance with the Quality assurance of Questionnaire distribution and collection of the Methodology is thus assured.

***Data Storage & Analysis***
The surveys will be kept as a excel sheet database. This database is specifically designed for the project, in order to be easy to use.
The paper questionnaires will be stored in the main office of SKGS in the Kolar district. They will be available for validation and verification.

## Monitoring of other parameters

***Baseline data***

Data and parameters ID 2 and ID 6 (respectively the number of households in baseline sample group and the amount of fuel i consumption in the baseline) were calculated with the findings of the baseline survey. In case the baseline needs to be updated – for example if some biodigesters are constructed in the geographical project boundaries, but with different energy patterns – a new baseline survey has to be conducted, and the new baseline consumptions will be an average of the original survey and the new survey.

***Non renewability rate of the wood, during the project activity***

Parameters ID 9 and ID 10 (respectively the annual biomass increment and the annual biomass harvesting) are necessary to calculate the non-renewability rate of the remaining wood consumption. However the methodology also specifies that "*in case the project proponent cannot show that a share of the biomass was non-renewable, it has to be assumed that all biomass applied in the project is non-renewable*". As studies to determine biomass increment and harvesting are difficult and costly, all the biomass used during the project activity by beneficiaries will be considered as non-renewable.

***Beneficiaries Data***

Data and parameters ID 1 and ID 5 (respectively the project area and the total number of households participating in the programme) are related to beneficiaries. They will be available in the database which keeps a record of all the beneficiaries of the project.

***Other parameters***

- Physical leakage of the biodigester (ID 12)
  As it cannot be measured, the default value of the gold standard methodology (10%) will be adopted.
- Global Warming potential of methane (ID 16)
  The value in use will be taken in the latest IPCC Guidelines.

## Monitoring Report

A monitoring report will be issued every year and it will record:

- The value of all the data and parameters based on the findings of the annual monitoring plan
- The Evaluation of Project Emissions

| Name | DATA TO BE MONITORED | Unit | Source |
|---|---|---|---|
| | **Animal Waste Management Data** | | |
| $\mu LC_{buffalo, s, y}$ | number of buffaloes in sample group of household h in year y | Animals | Monitoring survey |

| | | | |
|---|---|---|---|
| | | /household | |
| $\mu LC_{\text{dairy cow, s, y}}$ | number of dairy cows in sample group of household h in year y | Animals /household | Monitoring survey |
| $\mu LC_{\text{other cattle, s, y}}$ | number of other cattle (cows and calves) in sample group of household h in year y | Animals /household | Monitoring survey |
| $GWP_{CH4}$ | Global Warming Potential (GWP) of methane, dimensionless | | IPCC Assessment report on Physical Science Basis of Climate Change 2007 & IPCC Guidelines 2006 |
| $MS_{\text{pasture, h, y, s}}$ | fraction of manure treated in the animal waste management system : pasture of household h in year y | % | Monitoring survey |
| $MS_{\text{burned for fuel, h, y, s}}$ | fraction of manure treated in the animal waste management system : burned for fuel of household h in year y | % | Monitoring survey |
| $MS_{\text{daily spread, h, y, s}}$ | fraction of manure treated in the animal waste management system : daily spread of household h in year y | % | Monitoring survey |
| $MS_{\text{backyard pit, h, y, s}}$ | fraction of manure treated in the animal waste management system : backyard pit of household h in year y | % | Monitoring survey |
| $MS_{\text{vermicompost, h, y, s}}$ | fraction of manure treated in the animal waste management system : vermicompost of household h in year y | % | Monitoring survey |
| $MS_{\text{biodigester, h, y, s}}$ | fraction of manure treated in the animal waste management system : biodigester of household h in year y | % | Monitoring survey |
| **Fuel Consumption Data** | | | |
| $FC_{\text{firewood, h, s, y}}$ | Mean wood consumption for cooking purposes of beneficiaries before the implementation of biodigesters | Twood/yr | Baseline Survey |
| **Socio-Economic Indicators** | | | |
| $\text{Income}_{\text{, h, s, y}}$ | Income of household h in season s of year y | Rs/yr | Monitoring survey |
| $\text{Time}_{\text{, h, s, y}}$ | Time spend on collecting wood for household h in year y | Days/yr | Monitoring survey |

| | | | |
|---|---|---|---|
| $CF_{h,s,y}$ | Quantity of fertilizer used per acre for household h in year y | Kg/acre/yr | Baseline Survey |
| $IV_{h,s,y}$ | Income from vermicompost of household h in year y | Rs/yr | Monitoring survey |

**Annexx 4**

**Cost of the project**

| Cost of a 2 Cu.m. Biogas reactor | | | |
|---|---|---|---|
| Particulars | Measure | Qty | Amount in INR |
| Bricks | Nos. | 950 | 4275 |
| Sand | Cubic feet | 80 | 2400 |
| Metal Chips | Cubic feet | 30 | 1200 |
| Cement | Bag (50Kg) | 12 | 3600 |
| Mild Steel | Kg | 10 | 500 |
| Digging of pit 12' dia and 6' deep | Unit | 1 | 1000 |
| 6" dia AC PIPE | RM | 1.6 | 144 |
| G.I. Nipple with welded brackets ½ inch dia | Nos. | 1 | 60 |
| Stove - Double burner ss | Nos. | 1 | 1200 |
| Hdpe Pipe 20 mm | R.M. | 30 | 450 |
| Gate valve, G.I. Nipples and other pipe fittings | | | 500 |
| Masonry | Piece Rate | | 1000 |
| Labour | Man days | 20 | 2000 |
| Pipe fitting charges | Job work | | 150 |
| Transport and handling | | | 400 |
| Overheads | | | 500 |
| **Total Unit Cost** | | | **19379** |

| Cost of the Vermicompost Production Unit | |
|---|---|
| Particulars | Amount in INR |
| Cement - 4 bags (Rs.300 X 4) | 1200 |
| Stone Chips 5 Cu.ft = 5 X Rs.40 per Cu.ft | 200 |
| Sand 18cu.ft = 18 X Rs.30 | 540 |
| Bricks 450 = 450 X Rs.4.5 each | 2025 |
| Stone Pillars | 1460 |
| Iron Sheets for roof - 8 Sheets | 2466 |
| Wooden poles | 324 |
| Miscellaneous material like nails, binding wire etc. | 300 |
| Labour for the building of tank and shed | 1300 |
| Iron Mesh for covering the tank | 400 |
| Cost of earth worms | 700 |
| Transportation and handling | 500 |
| Over Heads | 400 |
| **Total Unit Cost** | **11815** |

The cost of a biogas unit is thus 19,379Rs, while the cost of the combined unit is 31,194Rs.

Other administrative costs, monitoring costs, and carbon finance transaction costs, are borne by SKGS, and are not included in this analysis.

## Annexe 5

Training Programme Provided by SKG Sangha: according to Pg – 11.

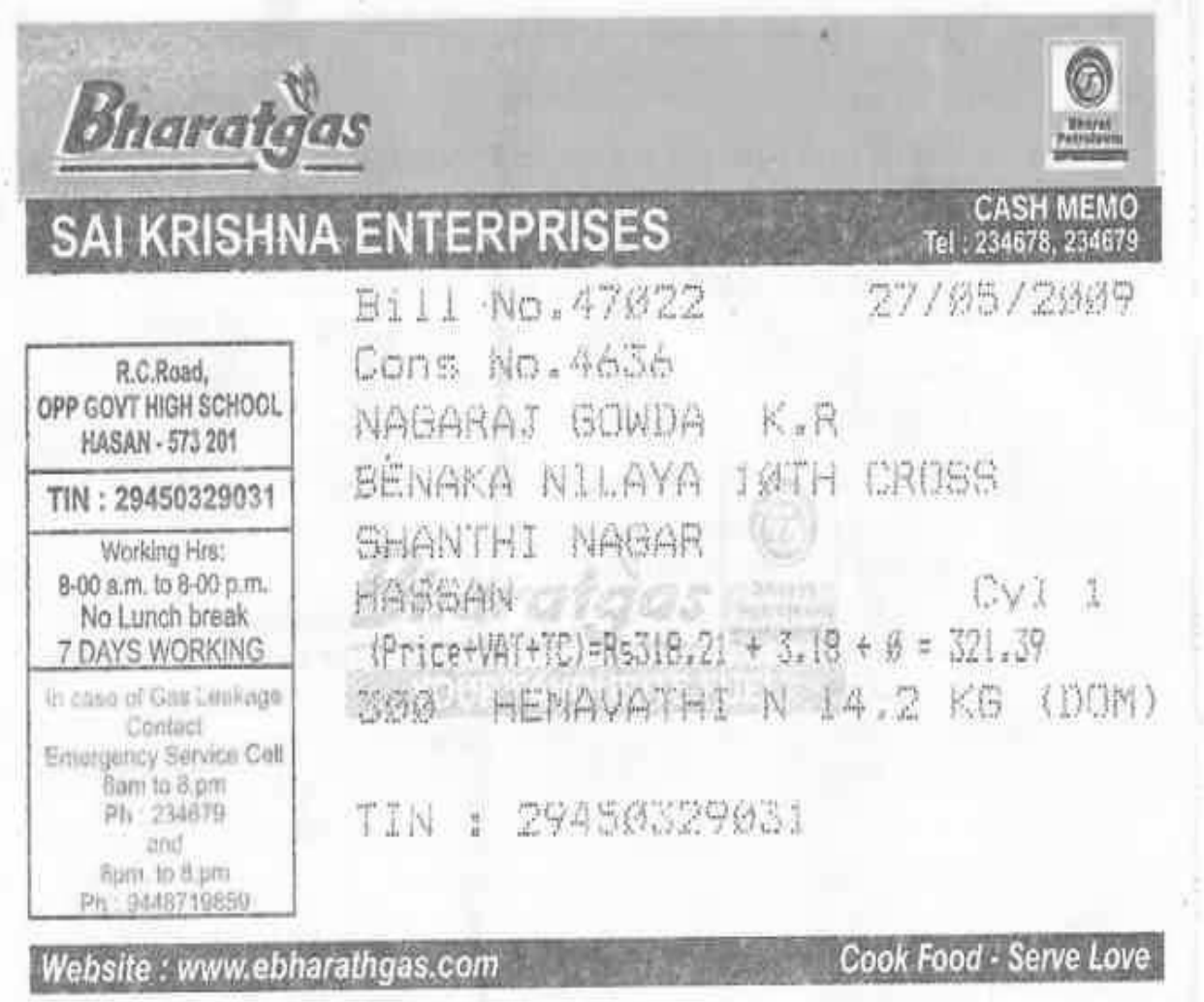
Over the past experiences SKGS has observed that to assure the working of any biogas plant, a regular maintenance and monitoring programme should be carried out. Therefore it conducts training programmes for the employees on a regular interval.

During implementation of the project, SKG employs a local person to regularly supervise and monitor the working of the biogas plants in the project area. These local representatives of SKG are regularly given training on the various technical issues that might come across for the failure of a biogas plant. Therefore such trainings make sure that the representative is able to solve any technical failures of a plant. He is also responsible to keep all the records of the working of the biogas plant and regularly provide a report to senior person available at the head office.


**Refresher training course for the supervisors of SKG Sangha team.**

**Annexes 6**

Scan copy of the LPG prices.



Bharatgas

SAI KRISHNA ENTERPRISES

CASH MEMO
Tel : 234678, 234679

R.C.Road,
OPP GOVT HIGH SCHOOL
HASAN - 573 201

TIN : 29450329031

Working Hrs:
8-00 a.m. to 8-00 p.m.
No Lunch break
7 DAYS WORKING

In case of Gas Leakage
Contact
Emergency Service Cell
8am to 8.pm
Ph : 234679
and
8pm to 8.pm
Ph : 9448719859

Bill No.47822 27/05/2009
Cons No.4636
NAGARAJ GOWDA K.R
BENAKA NILAYA 10TH CROSS
SHANTHI NAGAR
HASSAN Cyl 1
(Price+VAT+TC)=Rs318.21 + 3.18 + 0 = 321.39
3000 HENAVATHI N 14.2 KG (DOM)

TIN : 29450329031

Website : www.ebharathgas.com

Cook Food - Serve Love

## Annexes 7

Traditional firewood based cooking stoves


Biogas stoves provided by SKGS along with the biodigester unit.

Construction of a biogas Unit


Name of the implementing organisations on the completed unit

Beneficiary with a vermicompost unit

## Annexes 8



The above pictures show that the pipes connecting the biodigester to the stoves provided by SKGS. The pipes are provided sufficient support in order to make sure there is continuous flow of biogas and avoid any potential technical failure. The SKGS team regularly visit the beneficiaries and also check the connections and supports of these pipes.