Agriculture technology transfer society (ATTS)

Production of biogas from animal manure in rural areas of Sudan

(The first registered project as CDM in Sudan)

BACKGROUND & RATIONALE

- **Previous work or activities done related to this request**

The rural population and large parts of the urban population are dependent on fuel wood for energy use especially for cooking purpose. Fuel wood make up approximately 80% of the country's energy supply. Fuel wood is mostly collected for cooking needs. Rampant deforestation have led to a loss of about 11.6% of Sudan's forest cover between 1990 and 2005 which is around 8,835,000 hectares. Two thirds of the forests in north, central and eastern Sudan disappeared between 1972 and 2001. In Darfur, one third of the forest cover has been lost between 1973 and 2006. This has led to increased habitat loss, deforestation and desertification.

The policy the government of Sudan for the energy sector promotes energy efficiency and renewable energy resources and to protect the environment. The General Directory for Energy Affairs (GDEA), Energy Research Institute (ERI) and National Energy Administration (NEA), evaluated the Chinese Biogas units installed in different parts of Sudan during 1992 and 1994. They recommended that government policy towards environmental health and sanitation has to encourage the adoption a combination of biogas digester/latrine that will contribute towards improving the present deplorable sanitary situation in the poor urban sector as well the vest rural area.

According to World Bank Statistics 2011, the estimated total population of Sudan is 34.3 Million. Sudan is an agricultural country with plenty of livestock and agricultural residues. A program of activities (PoA) will be implemented across all potential rural households in all the states in Sudan. In the present scenario the rural households use fuel wood for cooking purposes. As per the Energy Statistics Database, United Nations Statistics Division, fuel wood consumption in Sudan by household per year is given as:

2009	8,100 thousand cubic metres
2008	8,050 thousand cubic metres
2007	7,995 thousand cubic metres
2004	7,700 thousand cubic metres
2000	7,475 thousand cubic metres
1995	6,920 thousand cubic metres
1990	6,255 thousand cubic metres

Kyoto Protocol

The Kyoto Protocol fulfils the commitment made by one hundred and eighty six countries under the UN Framework Convention on Climate Change (UNFCC) that industrialized countries – who are responsible for the vast majority of emissions that cause climate change – should take the first steps towards sustainable energy consumption, **use of clean technologies** and **sustainable** land management practices, which are needed to mitigate the impacts of climate change. Many **industrialized governments** that have ratified the Protocol have already begun implementing domestic policies and regulations that will require emitters to **reduce greenhouse gas emissions**, according to the established targets. So far, experience has shown that the cost of reducing one ton of carbon dioxide (a greenhouse gas) can cost from $15 up to $100 in industrialized countries.

Carbon finance is the general term applied to resources provided to a project to **purchase greenhouse gas** (GHG) **emission reductions** ("carbon" for short). Commitments of carbon finance for the **purchase of carbon have grown rapidly** since the first carbon purchases began less than eight years ago. Verified Emission Reductions **(VERs)** are units of greenhouse gas reductions generated from Clean Development Mechanism **(CDM)** projects under the Kyoto Protocol, in developing countries and verified by ***external, UN-accredited third party verifiers***. Certified Emission Reductions (CERs) are also project-based but have **undergone registration** (e.g. by the

CDM Executive Board, EB). CERs can be used for **compliance with Kyoto Protocol obligations or to meet emissions** caps under the European Union Emissions Trading Scheme.

OBJECTIVE, ACTIVITIES & EXPECTED OUTCOMES

Project Objectives

- **What is to be achieved by the intervention (e.g. study, missions, training, etc.)?**

Project Purpose:

To switch from traditional biomass resources or fossil fuels to biogas fired generation capacity improves security of energy supply. Land application of raw or composted manure can be tailored to reduce the emission of GHGs and their impact on the environment.

Improvement of sanitation conditions for women and their children as biogas is a smoke-free energy and also reduces the workload in fetching fuel wood.

- **Describe shortly what types of activities are planned**

General operating and implementing framework of PoA

The proposed small scale Program of Activity ("hereafter SSC-PoA") involves the installation of biogas digesters in the households of Sudan for the treatment of the animal manure. The biogas thus generated will be used for cooking purposes. Implementation of the proposed activity will reduce the usage of non-renewable biomass i.e. fuel wood for household activities. Thus, the PoA will reduce the GHG emission occurring from the combustion of non-renewable biomass, i.e. fuel wood, thereby also contributing to sustainable development. In the absence of the implementation of the PoA all the manure would be left to decay and thus the PoA will contribute to the sustainable development of the rural households involved in the project. Agricultural Technological Transfer Society (ATTS) is the coordinating/managing entity ("CME") for this SSC-PoA and will be implementing the CDM. Each component project activity (CPA) under the proposed SSC-PoA will involve in the implementation of biogas digesters of 6 m^3 capacity each for single households. Once the digesters will be installed and commissioned, the biogas generated in the digester shall be used to meet the energy requirement for cooking purposes of the household thereby replacing the use of fuel wood.

CoreCarbonX offer carbon management services to ATTS. These range from the development of the project document (PoA-DD), monitoring reports to the management of the entire CDM cycle up to the issuance of the certified emission reduction (CERs).

Management system

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The operational and management arrangements as established by the CME for implementing PoA are as follows:

(i) A record keeping system for each CPA under the PoA

Pursuant to the installation of biogas digester units, the CPA implementer will make sure that data regarding the installations in house hold are electronically archived for claiming emission reductions. This involve various details involving

- Name of customer
- Address and ID number
- Biogas digester serial number
- Installation date

Based on the agreement, CPA implementer will transfer the information of each biogas to the installation record, which will ensure that no biogas unit is counted more than under the SSC-CPA

or the PoA. The installations record will further be transferred to the CME which is stored in electronic format as well as in the paper format. These records will also serve as the basis for the calculation of CERs

The information collected by the distributors is screened on a periodic basis by cross checking of the installation records by CME in order to ensure the authenticity of installations. The CME will impart the initial training for the distributors. The distributors will provide the further training to the technicians employed for installation of biogas digesters and further oversee the implementation of the biogas digesters. Training will be given to technicians on implementation record keeping and maintenance of the digesters. These technicians will be designated for certain number of biogas digesters and will be responsible for data recording and data storage. Suitable training regarding the rules of the CDM and PoA will be given to each distributor and also to each new biogas digester technician.

The CME shall develop and implement a management system that includes the following
(a) A clear definition of roles and responsibilities of personnel involved in the process of inclusion of CPAs, including a review of their competencies:

Role	**Responsibility**
Distributor	Will make sure that data regarding the installations in house hold are electronically archived to avoid repetitions
Analyst, CME	• Obtains the inputs from the manufacturer of biogas equipment and the sales agreement • Calculates the energy saving from each biogas digester • Conduct the local stakeholder consultation meetings for the CPA The sampling plan along with the sample size calculation as determined by analyst CCX will be employed by Analyst CME for: • Conducting the survey for a representative sample for computing the number of biogas digesters installed as the part of the program which are still operating • Coordinating with the third party agency for calculating the efficiency of representative sample of the operating biogas once every year • Calculating the average annual consumption of woody biomass per digester substituted using the sampling survey before the installation of biogas digesters
Expert, CME	• Analyzes the computation sheet provided by Analyst CCX for the computations of the energy savings and approves the additionality of the CPA • Checks the survey results as conducted by Analyst CME • Forwards the CPA to Director CCX for the inclusion in the PoA
Analyst, CME	• Determines the energy savings of the CPA • Analyses if the CPA falls under the positive list as specified in para 2(c) "Guidelines for demonstrating additionality of small-scale project activities". • Determines the sampling plan latest standard/guideline for sampling and survey required by CDM EB.
Director, CME	• Reviews the additionality as determined by the analyst, CCX • Reviews the Sampling Plan and the sample size calculations as prepared by Analyst CCX • Forwards the inclusion of the CPA to the Director, CME

(b) Records of arrangements for training and capacity development for personnel:
The distributor of biogas equipment and CME will be responsible for the installation and

maintenance of biogas digester. The operation of the biogas is carried out by the user, and training on how to operate and maintain the biogas is given by the distributor. The CME will provide the initial training for the distributor; and the training will be penetrated through to the users. The training records for the distributors will be maintained in the database of the CME. Further on the recruiting of the new employee by the distributor in the team to disseminate the biogas; the distributor will inform the CME of the same and CME will impart the initial training to the new employee.

Physical maintenance of the biogas will be provided by the distributor and their technicians. The distributors will follow the monitoring plan and procedures for identifying each biogas set up during the course of the project and those which are still in use, so the appropriate number of emission reductions is claimed. To facilitate this process, the distributor will assign a serial number to each digester during its set up and record this number in the installation record. The serial number will be present on each biogas and also on the sales agreement corresponding to the digester. The distributors are also responsible for collecting the sales agreement contract from the users.

Sales contract and installation record

(c) A procedure to avoid double counting (e.g. to avoid the case of including a new CPA that has already been registered either as a CDM project activity or as a CPA of another PoA):

Before the installation of the biogas digester, the user shall be informed that CDM finance is being used to fund the biogas installation, and the user shall agree, as per sales contract, to:

− Cooperate with the distributor and the CME for monitoring purposes

− Transfer the rights of the CERs to the CME

Monitoring

Each SSC-CPA keeps an installation record, which lists all biogas installed with a unique serial number per biogas in addition to a record of the location of the biogas and the kitchen. All distributors' records are screened by the CME together with cross-checks on the distributors' installation records in order to confirm that the installation record is authentic and that no double counting occurs.

(d) Records and documentation control process for each CPA under the PoA:

The information collected by the distributor is transferred to an electronic database (the installations record) which is updated regularly and shared with the CME. The installations record carries all the sales information listed above including the actual installation date. The installations record is a key component of the annual monitoring report, since the actual installation date is used to calculate the emission reductions achieved by the biogas installed.

(e) Measures for continuous improvements of the PoA management system;

It will be ensured that the PoA management system will be reviewed annually for the continuous improvements for the management system. There will be a systematic collection and analysis of data to ensure that:

• There is relevant and sufficient documentation of management systems for the scope and scale of biogas project implementation.

• The system is focused on providing quality training, assessment and support services.

- Arrangements are in place to meet regularly with distributors to seek feedback and make changes in response.
- Appropriate selection processes and ongoing professional development for trainers and assessors.
- Strong customer service standards.
- Maintenance of and improvements to training and assessment of the distributors

The CME will also monitor their improvements to determine their effectiveness and make further changes if needed.

Start date of PoA
PoA will be the date of commencement of validation of the PoA – i.e. the date on which the PoA-DD is first published for global stakeholder consultation.
Length of the PoA
28 years for installation of 26,000 units in all states of Sudan. The project is registered as CDM with the following link http://cdm.unfccc.int/ProgrammeOfActivities/poa_db/QZXS7GO3PIY5U0J84F1NK9A6ELVBMC/view.
For the verification milestone we need to install 200 biodigestors

Analysis of the environmental impacts
The implementation of PoA does not impose any impacts on the ecological system in the surrounding areas. The project activity included in this PoA helps in reducing the consumption of firewood by installing household biogas digesters for cooking purpose thereby reducing the pressure of deforestation, reducing indoor air pollution. The use of household biogas technology will reduce adverse environmental and social impacts associated with the use of non-renewable biomass. The reduced consumption of the stated baseline fuel will have sustainable benefit for all households included in the project activity. The implementation of the PoA reduce workloads involved in fuel collection, and by reducing indoor air pollution, they can reduce the risk of respiratory diseases, especially for women and children. Household biogas also contributes to environment protection by reducing biomass consumption and hence greenhouse gas emissions, mainly CO, even the combusted biomass originates from non-renewable stocks.

Sudan itself has not legislated for EIA as a mandatory requirement. Instead legislation pertaining to environmental management is found in the Environment Policy Act of 2001 which, under section 9, stipulates that EIA be undertaken where the quality of the environment is to be adversely affected upon implementation of major development projects[5]. The authority responsible for environment management is the Higher Council for Environment and Natural Resource. Since the typical SSC-CPA will involve the installation of household biogas digesters which will have positive environmental impact, hence this does not need any environmental impact assessment.

Expected Outcomes:
- Reduced indoor smoke-induced illnesses
- Reduced poor-sanitation induced illnesses
-Reduced drudgery from fuel wood collection
- Reduced pressure for illegal forest encroachment
-Reduced workload for food-preparation
-Reduced soil erosion/degradation
-Improved opportunity for education

Expected Outputs:
- Reduced direct medical costs
-Reduced expenses conventional energy sources
-Reduced chemical fertilizer expenditures
-Increased opportunity for (small-scale) organic agriculture
-Improved agricultural yields
-Increased family income
-Increased employment and generating opportunities
-Opportunity to develop markets for (organic)agricultural produce
-Generating Clean Development Mechanisms revenue

Expected achievements

Environmental well-being:

• The PoA will replace the use of fuel wood in a large number of households in Sudan which will result in the GHG emission reduction and conservation of fuel wood.

• The by-product of the biogas digester is a useful fertilizer and displaces in reducing the use of harmful chemical fertilizers. The project activity under PoA will generate organic fertiliser.

Economic well-being:

• After the installation of biogas digesters, the households will not need to make expenses on fuel wood and save their time resources for other uses. Hence, the PoA will make a significant contribution to the economic well-being of the rural households.

The PoA will create certain employment opportunities in the area for skilled and unskilled job where each CPA is located, leading to a general increase in local-community income due to installation of digester.

Social well-being:

• The PoA increases the employment opportunities in the area where each CPA is located, leading to a general increase in local-community income.

• The PoA will reduce the consumption of fuel wood by participating households and will therefore reduce the pressure on scarce forest resources in the project area.

• The PoA will make the households self-sufficient in terms of energy requirement and contribute to their general well-being.

• The combustion of fuel wood create serious health hazard to the people. The PoA will also improve the indoor air pollution because of replacement of non-renewable fuel wood health of the rural people by replacing the fuel.

ACTION & IMPLEMENTATION PLAN

Activity	**Time frame**
Identification of 200 households at villages of north Kordofan	3 months
Questionnaire conduction and contract with beneficiaries	1 months
Installation of 200 biodigester	5 months
Training on usage of biodigesters	2 months
Monitoring	6 months

RESOURCE REQUIREMENTS / BUDGET ESTIMATE

The estimated cost of the project is **USD 440,000**

Activity	**Budget**	**Total USD**
Questionnaire conduction and contract with beneficiaries	200 USD x 10 persons	2,000
Installation of 200 biodigester	2000 per biodigester	400,000
Training on usage of biodigesters	40 per biodigester	40,000
Monitoring	200 USD x10 persons	2,000
Total		440,000