



# PROJECT IDENTIFICATION FORM (PIF)<sup>1</sup>

PROJECT TYPE: Full-sized Project

TYPE OF TRUST FUND: GEF Trust Fund

## PART I: PROJECT IDENTIFICATION

Project Title:	Clean Energy Technologies for the Rural Areas in Cuba (CleanEnergy-Cuba)		
Country(ies):	Cuba	GEF Project ID: <sup>2</sup>	5149
GEF Agency(ies):	UNDP	GEF Agency Project ID:	4899
Other Executing Partner(s):	Estación Experimental Indio Hatuey (EEIH), Matanzas, Cuba	Submission Date:	2012-09-14
		Resubmission:	2013-01-18
GEF Focal Area (s):	Climate Change	Project Duration(Months)	48
Name of parent program (if applicable): ➤ For SFM/REDD+ <input type="checkbox"/>		Agency Fee (\$):	260,065

### A. FOCAL AREA STRATEGY FRAMEWORK<sup>3</sup>:

Focal Area Objectives	Expected FA Outcomes	Expected FA Outputs	Trust fund	Indicative Grant Amount	Indicative Co-financing
				(\$)	(\$)
CCM-1	Technologies successfully demonstrated, deployed, and transferred	Innovative low-carbon technologies demonstrated and deployed on the ground	GEF	2,050,000	8,934,725
	Enabling policy environment and mechanisms created for technology transfer	National strategies for the deployment and commercialization of innovative low-carbon technologies adopted		557,166	3,176,791
Subtotal				2,607,166	12,111,516
Project Management cost				130,358	350,000
<b>Total project costs</b>				<b>2,737,524</b>	<b>12,461,516</b>

### B. PROJECT FRAMEWORK

**Project Objective:** To increase access to bioenergy technology in Cuba by promoting the use of biodiesel and biogas technologies by rural farmers.

Project Component	Grant Type	Expected Outcomes	Expected Outputs	Trust Fund	Indicative Grant Amount (\$)	Indicative Co Financing (\$)
1. Information and policy development	TA	1. Policies supportive of small-scale bioenergy development	1. Information concerning economic, production, social and environmental aspects of integrated food and small-	GEFTF	250,000	397,099

<sup>1</sup> It is very important to consult the PIF preparation guidelines when completing this template.

<sup>2</sup> Project ID number will be assigned by GEFSEC.

<sup>3</sup> Refer to the reference attached on the Focal Area Results Framework when filling up the table in item A.

		have been formulated and recommended for approval/enforcement.	<p>scale bioenergy production by rural farmers, has been updated and analyzed.</p> <p>2. An updated assessment has been made of the potential production and use of biodiesel and biogas in agriculture and livestock farming.</p> <p>3. Strategies to provide financial incentives to rural farmers are proposed, based on cost analyses of small-scale biodiesel and biogas production.</p> <p>4. Paper on small-scale bioenergy development, including recommendations for policy development, has been prepared based on updated technical information and knowledge</p> <p>5. Concepts for a national, small-scale, bioenergy strategy have been drafted and consulted with relevant actors and authorities.</p> <p>6. Policy recommendations for facilitating the enforcement of bioenergy technology developments (e.g. power purchase agreements, long-term feedstock supply arrangements, or IPRs as applicable)</p>			
2. Technology transfer and development	Inv	2. State-of-the-art knowledge and local manufacturing of small-scale biodiesel and biogas systems, equipment and components have been transferred to agronomic institutes and manufacturers in Cuba.	<p>1. National manufacturers have acquired access to innovative materials for biodigester construction (membranes, HDPE) through technology transfer.</p> <p>2. Cost-effective designs for small-scale biodiesel conversion (100-400 litre/day) have been transferred to technological institutes and manufacturers in Cuba.</p> <p>3. The national industry capacity to produce small-scale biogas and biodiesel systems has been increased by investment in production facilities.</p> <p>4. A national production system has been set up to produce certified seeds for vegetal oil plants (Jatropha curcas, palm oil, etc.).</p> <p>5. The technical conditions and parameters for the application of locally produced biodiesel in agroindustrial equipment and engines, have been determined.</p> <p>6. The integration of bioenergy systems in rural farms and the use of byproducts (such as biofertilizer) has been assessed through field research and pilots.</p>	GEFTF	2,050,000	8,934,725
3. Institution building, training and promotion.	TA	3. Bioenergy technology diffused through increased knowledge and demonstration of biodiesel and biogas systems	<p>1. A national expertise center on integrated bioenergy production to support the implementation of biodiesel and biogas systems in rural farms, has been established within EEIH.</p> <p>2. A national training and educational</p>	GEFTF	307,166	2,779,692

		system on small-scale biodiesel and biogas production and use, has been implemented. 3. Networks of trained bioenergy professionals and local agronomic organizations, have been established in selected municipalities. 4. Bioenergy technology case study database and manuals documenting best practices/lessons learnt from completed and disseminated pilot demonstrations		
Project Management Cost <sup>4</sup>			130,358	350,000
<b>Total Project Costs</b>			<b>2,737,524</b>	<b>12,461,516</b>

### C. INDICATIVE CO-FINANCING FOR THE PROJECT BY SOURCE AND BY NAME IF AVAILABLE, (\$)

Sources of Co-financing for baseline project	Name of Co-financier	Type of Co-financing	Amount (\$)
National Government	Government of Cuba – EEIH	In-kind	3,200,000
National Government	Cubaenergía/CITMA	In-kind	50,000
Local Governments	Selected Municipalities and Local Producers	Cash/In-kind	3,172,500
Bilateral Agency	EEIH/SDC (BIOMAS Phase II)	Cash/In-kind	4,753,892
Bilateral Agency	ANAP/Oikos/European Union (AGROENERGIA)	Cash	1,235,124
Multilateral agency	UNDP	Cash	50,000
<b>Total Co-financing</b>			<b>12,461,516</b>

### D. GEF/LDCF/SCCF/NPIF RESOURCES REQUESTED BY AGENCY, FOCAL AREA AND COUNTRY<sup>1</sup>: N.A.

## PART II: PROJECT JUSTIFICATION

### A. DESCRIPTION OF THE CONSISTENCY OF THE PROJECT WITH:

#### A.1.1. The [GEF focal area](#) strategies: Climate Change

The objective of the Project is to increase access to bioenergy technology in Cuba by promoting the use of biodiesel and biogas technologies by rural farmers. This will be achieved through: a) consolidation of technical, social, economic and environmental information as input for national policy development on small-scale bioenergies; b) transfer of technology to enable Cuba to design and produce state-of-the-art, cost-effective biogas and biodiesel equipment; and c) institution building, training and promotion to create supportive expert networks to integrate these technologies in rural agriculture and livestock farms.

This objective is fully consistent with Objective CCM-1 (Technology Transfer) under the GEF-5 focal area Climate Change, namely to “Promote the demonstration, deployment, and transfer of innovative low-carbon technologies (CCM-1)”. As a result of the proposed intervention, the identified barriers related to technology (know-how, designs and materials) and capacity (trained human resources and adequate supportive institutional framework for end-users) will be greatly reduced. The Project will establish a solid technological and knowledge basis for policy development and technology diffusion, which will

<sup>4</sup> Same as footnote #3.

result in a national demonstration of bioenergy systems, equipment and components. GEF support is requested to assist Cuba during the internal process of sector transformation, and is deemed critical to reduce the indicated barriers.

**A.2. National strategies and plans or reports and assessments under relevant conventions, if applicable, i.e. NAPAS, NAPs, NBSAPs, national communications, TNAs, NIPs, PRSPs, NPFE, etc.:**

The Project responds to the priorities of the Ministry of Science, Technology and Environment (CITMA), the Ministry of Agriculture (MINAG), and the Ministry of Basic Industries (MINBAS, in charge of energy policy). Strengthening the energy infrastructure and supply in the rural areas is a critical condition to increase food production and security, which is a key priority in Cuba's development policies. Decentralized food and energy production also fits into the national plans to adapt to climate change. Governmental Workgroups, which have an advisory task, are in the process of preparing conducive policy for the development and utilization of renewable energy resources, including biogas and biodiesel and will contribute to mainstreaming the subject into government policies and programmes.

These priorities to which the project aligns are also in line with the focus of Cuba's mitigation options on a greater efficiency and a better use of national energy resources, as indicated in its Initial National Communication (INC) to the United Nations Framework Convention on Climate Change (UNFCCC). The options identified by the project in bioenergy technology were designed considering the following key elements of successful technology transfer, as per UNFCCC's technology transfer framework: (1) technology needs assessment; (2) technology information; (3) enabling policy-level environment; (4) capacity building; (5) mechanism to facilitate institutional and financial support to technology cooperation, development and transfer. These elements are already captured by Cuba's INC, to promote sustainable energy technology developments, and will also be included in the technology needs assessment (TNA) of the forthcoming Second National Communication.

On April 2011, Cuba approved the "Economic and Social Policy Guidelines of the Party, Government and State", which depict the priorities that will guide the socio-economic development of the country. The Guidelines No. 108 and 113, Chapter III "External Economic Policy" of the mentioned guidelines declare priority on the use of international cooperation support for equipment and technology related to renewable energy sources, for the implementation of renewable energy technology applications. Guidelines No. 131, 133 and 139, Chapter V "Science, Technology, Innovation and Environment Policy" prioritize: conservation and efficient use of land, water, the atmosphere, forests; conservation of biodiversity; and promotion of environmentally sustainable production methods. Guideline No. 247, Chapter VIII "Industry and Energy Policy" highlights the use of renewable energy technologies (RETs), including biogas, wind energy, hydropower, biomass, solar energy, and others. Priority should be given to RETs according to their economic benefits.

The proposed project is consistent with the Government program "Revolución Energética" launched in 2005. A description of the main outputs of this program can be found in the next section. The Project is instrumental for implementing Environmental Law No. 81 (1997), and National Environmental Strategy 2011-2015, focused on reverting land degradation and deforestation, the loss of biodiversity, pollution, water resources, as well as mitigation of, and adaptation to, the effects of climate change.

**B. PROJECT OVERVIEW:**

**B.1. Describe the baseline project and the problem that it seeks to address:**

National energy security is vulnerable because of high dependency on imported petroleum and derived products. During 2005 – 2010, these imports represented 40-45% of total energy consumption and of

43% of the total value of imports in Cuba during in 2010<sup>5</sup>. Domestic, renewable energy sources still make up a small share in the national energy matrix, and has diminished during the above-mentioned period from 17% to 12 %<sup>6</sup>. Under the Governmental program “Energy Revolutions”, which has started in 2005, renewables were addressed by: (i) implementing a wind resource assessment programme, after which two commercial wind farms were built, and (ii) demonstrating the use of vacuum tube solar water heaters in the country. Presently, a production facility for such systems is operational in the country.

A positive development indicator is the unbundling of economic growth and energy consumption. While GDP raised 72% from 1997 to 2010<sup>7</sup>, the total secondary energy consumption diminished to 61%. This achievement demonstrates structural changes in the economy. The contribution of the agriculture sector to the GDP has descended steadily from 13.7% in 1975 to 3.8 % in 2008. The sector’s secondary energy consumption has increased however, from 5% to 7.6% of the national energy consumption. Electricity and diesel oil are the two main energy carriers for the agricultural sector with a share of 60.5% and 33.1 % of the total energy consumption in 2008.

National food security is also vulnerable as the country relies too heavily on food imports. Although decreasing, the value of food products in total imports was in the range 18% (2000) to 13% (2009). Imported products include rice, milk, meat, and grain. To reduce this vulnerability, the government is supporting a set of actions aimed at increasing national food production. However, a strategy to increase national food production would, at the present high energy-intensity of the sector<sup>8</sup>, further jeopardize national energy security. Bringing down the energy use per unit of food produced is therefore a prerequisite for scaling up of national food production. This can be pursued by a more efficient energy use by the sector and by harnessing local energy sources, such as biomass residues and resources.

It must be noted that the Cuban economy is in the process of decentralization. The municipalities will play an increasingly important role in the decision-making processes and must be prepared to trigger and coordinate regional economic development. This transition process needs time, especially in the agricultural sector. The current institutional and regulatory frameworks require considerable transformation to be brought in line with the decentralization of the economic model.

Until the 1990s, the food production model was based on large agricultural and livestock companies owned by the State. As a result of the disappearing of the former USSR and the associated loss of income from economic trade with Cuba, most state-owned companies were socialized into different forms of cooperative ownership (these are currently local producers under decentralized local government oversight). Alongside these companies, independent farmers play an increasingly important role as national food producers<sup>9</sup>, especially after approval of Decree-Law 259 (2009) on the distribution of unused land, and the “Municipal Initiative” (2009), which allowed payments in convertible currency to stimulate economic development in the primary sector. The decentralizing process has been outlined and approved at the 6<sup>th</sup> Party Congress of April 2011.

The combined production of energy and food is considered critical in order to: (i) supply local production systems with the necessary energy inputs; and (ii) sell surplus energy to other end-users. One of the strategies to reconcile increased food production with energy security, is to change the patterns of food and energy production and rely on local energy sources instead of imported energy carriers. In this context, a significant contribution can be made by the development of so-called bioenergy or agroenergy.

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<sup>5</sup> The combined imports of food and petroleum products add to 55% of total imports in 2010.

<sup>6</sup> Excluding petroleum imports, renewable energy sources accounted for 31% of national energy sources in 2005 (which has lowered to 21% by 2010).

<sup>7</sup> At constant prices.

<sup>8</sup> In particular, its consumption of imported fuels.

<sup>9</sup> In 2010, the private sector owned 90% of the dedicated land and produced 85% of the crops other than sugar cane (source National Statistics Office ONE, 2010), 68% of the pigs and 90% of the cows. These figures show the critical role that the large number of private producers (typically involved in small and medium size farms) play for food production in Cuba.

Finally, it must be observed that many areas in Cuba suffer from soil degradation, salinization and desertification. This condition is aggravated by the effects of climate change. The conservation of degraded soil must therefore be a key element in strategies to promote energy production and sustainable production chains in the rural areas in Cuba.

### Baseline project

The baseline project consists of decentralized initiatives to support food production by small and medium-scale private farmers and make a start with local bioenergy production, specifically biogas and biodiesel. These initiatives are sustained with financial and institutional support from international donor organizations, and from national sector institutions. Simultaneous to increasing local agricultural output, an effort is made to make production chains more sustainable and to revert soil degradation processes. While encouraged by the national Government, it must be noted that these initiatives operate locally. Field experiences and consolidated knowledge and information on bioenergy production technologies, and their application in the context of Cuba, is needed. Once available, the central Government can benefit from this knowledge to devise supportive technology transfer and development policy instruments.

The baseline project is a joint initiative by the “Center for Information and Energy Development – Cubaenergía” and the agronomical research institute “Estación Experimental Indio Hatuey - EEIH”. Cubaenergía is a unit within the Ministry for Science, Technology and Environment (CITMA) and acts as a knowledge center for the Government. EEIH is a renowned agronomic technology centre ascribed to the Ministry of Higher Education (MES). Both institutes work closely with international donor agencies, specifically the European Union Food Programme, Swiss-based COSUDE, and UNDP, in a number of projects targeting energy and food supply technologies by the rural sector.

Within the framework of the BIOMAS I project, implemented by EEIH and financed by COSUDE<sup>10</sup>, a *Jatropha Curcas* plantation combined with food crops is being developed near Guantanamo, in the eastern part of the island. A small demonstration plant for biodiesel production is in the startup phase. The key lessons-learned from BIOMAS I are that: (i) local energy supply effectively increases food production; and (ii) the integrated, local production of food and energy enhances the economic and environmental feasibility of agricultural production chains. These positive impacts induced COSUDE to prepare a second phase<sup>11</sup>. The BIOMAS II project<sup>12</sup> aims at transforming the pilot experiences from Phase I into municipal development strategies for integrated food and energy production, and to establish a direct link with national energy policy. The project will also be implemented by EEIH in coordination with partner institutions in 6 provinces. Parallel initiatives are the AGROENERGY and CO-INNOVATION projects, jointly executed by EEIH and OIKOS<sup>13</sup>. All projects rely on inputs from the participating municipalities and from EEIH and the Government. These interventions, however, require an enabling environment for technology transfer so as to result in the identification, assessment and pilot bioenergy technology demonstrations.

The donor initiatives are coordinated by the Government of Cuba (MINCEX) and implemented with support from EEIH. UNDP has played an important channel for bilateral and multilateral agencies to coordinate and/or implement individual initiatives and programmes, and UNDP will continue playing this role. This set of national and donor initiatives constitutes a baseline programme, targeting at testing and implementing small-scale bioenergy technology systems into small and medium-size farms; and to demonstrate its potential to all stakeholders, including policy makers.

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<sup>10</sup> SDC/COSUDE: Swiss Agency for Development and Cooperation.

<sup>11</sup> Please consult the BIOMAS’ website: <http://biomascuba.ihatuey.cu/>

<sup>12</sup> COSUDE Project No. 7F-06169.02, “BIOMAS Phase II – Biomass as a renewable energy for the rural area”, to be implemented between April 2012 and December 2015 with a budget of CHF 4,175,000.

<sup>13</sup> A non-governmental organization based in Portugal. Funding for the Agro-energy and Co-innovation projects is obtained under European Commission Programmes.

However, important barriers are present, which are not addressed under the baseline project, in order for the demonstrations to result in nation-wide deployment, diffusion and investment in bioenergy technology. The main barrier is the lack of adequate technological knowhow, including access to designs and state-of-the-art materials, for the construction of bio-digesters and biodiesel plants in Cuba. Current initiatives (e.g. AGROENERGY, CO-INNOVATION, and COSUDE) fall short of addressing key elements required for successful bioenergy technology transfer (e.g. institutional/financial support mechanisms; enabling policy environment; technology information). In order to address these barriers, a strong effort is needed to involve national manufacturers to learn, develop and apply modern bioenergy technologies (either through national research and product development, or by production under license, or other agreements with foreign companies and institutes, for example within the framework of North-South/South-South technology cooperation), and disseminate and deploy their use nationwide, so they are ready to reach their market potential in Cuba. Preliminary information on each of the barriers is provided below. During the project design and preparation stage, further identification of barriers will be done, as well as a detailed barrier analysis to verify and confirm the nature and extent, the immediate and root causes of each barrier under each barrier category, and the inter-relationship of these barriers.

Policy and regulation barrier: Although renewable energy (RE) has been identified as a priority, as stated in the Economic and Social Policy Guidelines, a structured medium-term action programme for the identification and assessment of innovation policies that would encourage the development of RE technologies, particularly for bioenergy, is still lacking. As a first measure, a price for solid biomass (firewood) has been defined for power generation in the sugar industry. A second measure is a special tariff (with a component in convertible currency) established for the net supply of electric energy by sugar cane factories to the national power network. However, specific policy and regulation to promote the production of bioenergy and its commercialization, especially by private farmers, are not foreseen in the short term. Linked to this constraint, while there are institutions such as EEIH or Cubaenergía with experience in bioenergy through ongoing North-South cooperation, the institutional framework for nationwide and decentralized capacity building for bioenergy technology development needs to be developed (e.g. MES, CITMA and MINBAS roles and expected contribution). The introduction of policy mechanisms, such as intellectual property rights, power purchase agreements or long-term supply agreements of bioenergy feedstock required a paradigm shift in Cuba's legislation that through the current initiatives will not take place. The absence of these regulatory provisions are a constraint to Cuba's intended local decentralization of bioenergy technology access and, thus, to the creation of a more favorable environment for the bioenergy technology developer/supplier (domestic or foreign entity), the technology recipient/distributor (domestic and/or local-based foreign entity), and for the policymaker (e.g. addressing challenges associated to market and trade policies).

Technology barrier: Practical experiences with bio-digesters in Cuba are mostly limited to the traditional, so-called "appropriate technologies" (the Chinese and Indian model) and biogas is only used for food preparation. There is lack of knowledge on modern digester designs and a lack of availability of plastic materials used in such designs. Modern methods, systems and components are necessary to build bio-digesters in sufficient large quantities to make real impact among the sector of small private farmers. There is currently limited critical mass to further support the decentralization and nationwide diffusion of bioenergy technology developments, despite the apparent abundance of biomass initiatives in Cuba.

Indeed, commercially available technologies for biodiesel production are commonly not suitable to local conditions. In the Cuban context, smaller-size (yet efficient) conversion plants would be more feasible. Globally, while there is potential for economies of scale in some bioenergy technologies (particularly with biomass combustion techniques), other technologies are less influenced by scale but other factors linked to scope (e.g. type, availability and cost of biomass feedstock, type of system suitable to local conditions given ranges of moisture or temperature). There is also a limitation on methanol availability and, given Cuba's large produce of sugar cane, biodiesel production based on ethanol would be more convenient and cost-effective. In the absence of effective plant designs, domestic industries lack

knowledge on digester and biodiesel conversion technology and by consequence, are not prepared to manufacture such systems.

There is further a lack of technical knowledge on the operation and performance of biogas and biodiesel systems embedded in food production chains. This involves agronomic, business management, and logistic aspects. Also, secondary products may be commercialized, such as bio-fertilizers. A specific technological barrier is the present lack of a certified production system for vegetal oil crops, specifically *Jatropha Curcas*. While field experiments are conducted by EEIH and locally (for example under the COSUDE project), the availability of certified seeds is critical to sustain the widespread use of small-scale biodiesel technology in the country.

Information barrier: Previous experiences and baseline activities have contributed to more balanced information on bioenergy production via seminars, meeting and technical and informational brochures. However, there is still a lack of consolidated information on the sustainability of bioenergy systems in the country and on their potential for up-scaling. Also, the impact of energy crops, such as *Jatropha*, is not completely understood and there is a great variety of experiences worldwide<sup>14</sup>. There is further a lack of practical information concerning the integrated production of biogas and biodiesel, the operation of equipment and the use of bio-energy sources in agricultural machinery and engines. Further unaddressed is the collection of systematic and updated information on bioenergy resources, energy consumption and supply data, and data on land use, availability of water resources and local infrastructure. Therefore, the limited building, sharing and dissemination of information on bioenergy technologies render these virtually unknown, in the Cuban context. Without adequate knowledge about feasible bio-energy technologies, potential suppliers and users of these technologies will not be motivated to contribute to the necessary market push that will bring about or influence transfer, deployment and commercialization of bio-energy technologies in Cuba.

Institutional and human capacity barrier: National and municipal institutions are not specifically focused on bioenergy development and its integration into food production chains. The associated staff is not specifically trained on this subject. Some engineers have basic knowledge on renewable energy technologies but the expertise and capacity to design more advanced bio-energy systems is insufficient. There is insufficient knowledge and hands-on experience concerning clean agro-industrial processes for producing biodiesel. Manufacturers and local technicians are not trained to produce operate, maintain and repair biogas and biodiesel equipment. Institutionalized support for bio-energy technology transfer processes, such as a national knowledge centres needs to be strengthened. In essence, the current institutional framework for technology transfer lacks several elements for it to take place: (1) technology needs assessment, (2) latest technology information, (3) technology-oriented laws and regulations (e.g. licensing, franchising, IPRs), (4) capacity building (including capacity to evaluate the actual benefits of bioenergy technology), or (5) mechanisms to facilitate support to technology cooperation, development and transfer (e.g. institutional procedures to evaluate, facilitate and approve partnerships between government and the private sector).

For instance, the preparation and implementation of rural energy systems requires creating new actors: (i) energy project developers; (ii) suppliers of equipment, including bio-digesters, biogas systems and biodiesel plants; (iii) skilled installation and service personnel; and (iv) agronomic experts knowledgeable in energy production. An overarching issue concerns the ownership, operation and financing modality for rural energy (and food) production; this effectively involves the choice of a business model for the rural farmers. This choice must be made in function of high-level policy considerations and based on social, economic, and technical analyses. Sensitization and training of rural farmers and local organizations is at the heart of the base project. Specific preparation of (new) actors (i-iv) is partially covered by the base project and not focused on energy conversion technology.

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<sup>14</sup> See, for example Fact Foundation: [www.fact-fuels.org](http://www.fact-fuels.org)



Finance: The financial barriers faced by the stakeholders can be mitigated by high-level policy (assigning financial resources to relevant sectors, such as the industry) or by market-based instruments (such as price incentives for specific products or achievements). Solutions to improve access to finance are (to some extent) explored under the base project. Access to foreign capital however remains a major barrier for Cuba; therefore, international cooperation programmes remain an important source of financing, especially for the rural sector, but are insufficient to create local entrepreneurship, and leverage additional capital for bioenergy technology diffusion through catalyzed investments. In addition, there are misconceptions regarding business risks and financing options to address them (e.g. insurance, project bankability, financial sector unawareness). Limited knowledge on the viability of bioenergy technology applications, their potential for cost reductions, efficiencies, economies of scale and scope, limit the ability to assess the profitability of such interventions. Indeed, bioenergy technology itself is very project and context specific. With several cost factors linked to both technology choice, but also other elements of the value chain (e.g. land title and availability, right of way for feedstock transportation, local supply and resource potential), it is complex to assess the financial viability of interventions.

**B. 2. Incremental /Additional cost reasoning: describe the incremental (GEF Trust Fund) activities requested for GEF financing and the associated global environmental benefits to be delivered by the project:**

The objective of the proposed UNDP/GEF Project “Clean Energy Technologies for the Rural Areas in Cuba (CleanEnergy-Cuba)” is: *“To increase access to energy in Cuba by promoting the use of biodiesel and biogas technologies by rural farmers”*. The project will pursue this through the following components:

1. Information and policy development
2. Technology transfer and development
3. Institution building, training and promotion.

The Project aims to reduce the national technological, institutional and human capacity barriers presently impeding the identification, assessment, demonstration, deployment and diffusion of small-scale bioenergy technology applications in Cuba, especially biogas and biodiesel production plants. The approach followed is by: (i) supporting the transfer of state-of-the-art technology to Cuban manufacturers and technicians; (ii) by creating an infrastructure for the deployment of bioenergy technology (including training of human resources and coordination between sector institutions); (iii) by addressing specific technological issues (including agronomic techniques, certified seed production, testing of biofuels in local agromachinery); and (iv) by generating a solid knowledge and information basis for policy development, including policy proposals for consultation with stakeholders (a so-called “green paper”).

GEF funding is requested to an amount of US\$ 3,200,000, of which US\$ 2,859,091 is for the project implementation. The Project will build upon the base project activities coordinated by EEIH and on a requested commitment from the national manufacturing sector, which until now has not been directly involved in bioenergy technology development. Support from this sector will be negotiated during the PPG phase and may be directly, or indirectly under the umbrella of key ministries, such as CITMA or MINBAS<sup>15</sup>. It is envisaged to obtain commitments and financial inputs from the manufacturing sector as part of technological cooperation agreements with foreign counterparts (such as joint ventures, bilateral (south-south) agreements, or license agreements). The indicative co-financing commitments amount to a total of US\$ 12,461,516, distributed as indicated in Table C (Part I of this document). The total project budget is US\$ 15,320,607 (excluding PPG resources).

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<sup>15</sup> An office (unit) for the support of bioenergy technology will be set-up within CITMA / Cubaenergia. The unit’s mission will be (i) to provide decision makers with updated biomass resource assessments, technology transfer evaluations and technical and economic feasibility studies, and (ii) to promote inter-institutional coordination and knowledge and information sharing on bioenergy supply

Alongside social and economic benefits at the local and national levels, the Project contributes to the reduction of greenhouse gases from organic residues and the offset of fossil fuels for transport and electricity generation. These benefits are mainly indirect as direct investment in energy generating equipment is limited to pilot installations (funded under the baseline project). In the medium-term, substantial benefits are expected as a result of market transformation, i.e. the delivery and installation of bioenergy equipment by rural farmers. These benefits are estimated to be of the order of 50,000-100,000 ton per year by offsetting fossil fuels. The indirect greenhouse gas emissions by avoided methane emissions from agricultural and pig farming residues are expectedly of the same order. Over a 10-year impact horizon, total GHG reductions would be of the order of 500 to 1,000 kton CO<sub>2</sub>eq. Assuming a GEF causality factor of 40%, the total emission reductions that can be ascribed to the project would be 250-400 kton CO<sub>2</sub>eq. The cost-effectiveness of the proposed Project would be of the order of US\$ 8 to US\$ 12.8 per ton CO<sub>2</sub>eq avoided.

The Project components are concisely described in the following paragraphs:

#### Component 1. Information and policy development.

*Outcome: "Policies supportive of small-scale bioenergy development have been formulated and recommended for approval."*

This project component envisages to collect and analyze input information to assess the potential for bioenergy in the rural areas, identify social, economic, environmental and agronomic constraints, and make recommendations to design effective support policies. Supportive studies and analyses performed under this component will feed into a policy concept (a "green paper") for consultation with involved stakeholders. The Ministry of Science, Technology and Environment (CITMA) will act as an intermediary between the Project and high-level policy makers. Under leadership of EEIH and Cubaenergia/CITMA, the collected information and analyses will be shared with local counterparts (farmers, municipal and sector institutions, donor agencies) through documents, internet and specific manuals, which will form the basis of a national innovation and technology transfer policy. This outcome will be achieved by delivering the following outputs:

Output 1. Updated and analyzed information concerning economic, production, social and environmental aspects of integrated food and small-scale bioenergy production by rural farmers.

Output 2. Completed updated assessment of the potential production and use of biodiesel and biogas in agriculture and livestock farming.

Output 3. Recommended strategies to provide financial incentives to rural farmers based on cost analyses of small-scale biodiesel and biogas production.

Output 4. Documented paper on small-scale bioenergy development, including recommendations for policy development based on updated technical information and knowledge.

Output 5. Draft concepts for a national, small-scale, bioenergy strategy vetted by relevant actors and authorities.

Output 6. Policy recommendations for facilitating the enforcement of bioenergy technology developments (e.g. power purchase agreements, long-term feedstock supply arrangements, or IPRs as applicable)

#### Component 2. Technology transfer and development.

*Outcome: "State-of-the-art knowledge and local manufacturing of small-scale biodiesel and biogas systems, equipment and components have been transferred to agronomic institutes and manufacturers in Cuba."*

Project component 2 is targeted at investments to establish the necessary technological know-how, skills and capacities in Cuba to design, construct, operate, maintain and repair small-scale biogas and biodiesel conversion plants. The main beneficiaries of this know-how are the national manufacturing sector, and technologic and agronomic institutions involved in bioenergy (including EEIH).

Technology transfer will first address the availability of modern materials for biodigester construction in Cuba, such as plastic membranes and foils. While such materials are widely available elsewhere, in Cuba they are scarce and expensive and in the absence of local production, they must be imported. Under this component, business strategies will be devised to increase the availability of these materials, for example by local production through pilot demonstrations of the design, engineering, manufacturing/fabrication of biodiesel and biogas systems, equipment and components<sup>16</sup>. A second field requiring technological inputs, is the design and construction of small-scale biodiesel conversion plants, possibly using ethanol as a chemical agent (instead of methanol). Such technology may be acquired under licence, joint-ventures or other kinds of partnerships.

Substantial investment is needed to enable national manufacturers to produce biodigesters and biodiesel system. This process involves cutting and welding of vessels, but also system integration, purchase or design of specific components, and abilities to install finalized systems at farms. Investment is further required to set up a production system for certified vegetal oil seeds, such as *Jatropha*. The Project aims to set up partnerships with foreign companies and institutions in the South to trigger the transfer of technology to Cuba and to mobilize investment capital.

Technology development further includes non-hardware aspects which are addressed under this component, including the integration of bioenergy systems in rural food production chains, agronomic techniques, and the use and commercialization of byproducts (biofertilizers). Field trials under this component will be conducted as part of the baseline pilots funded by COSUDE.

This project component envisages the following outputs:

Output 1. National manufacturers that have acquired access to innovative materials for biodigester construction (membranes, HDPE) through technology transfer.

Output 2. Cost-effective designs for small-scale biodiesel conversion (100-400 litre/day) that have been transferred to technological institutes and manufacturers in Cuba.

Output 3. New installed production facilities for producing small-scale biogas and biodiesel systems.

Output 4. Established national production system for producing certified seeds for vegetal oil plants (*Jatropha curcas*, palm oil, etc.).

Output 5. Established technical conditions and parameters for the application of locally produced biodiesel in agroindustrial equipment and engines.

Output 6. Completed assessments through field research and pilots of the integration of bioenergy systems in rural farms and the use of byproducts (such as biofertilizer).

### Component 3. Institution building, training and promotion.

Outcome: *“Bioenergy technology diffused through increased knowledge and demonstration of biodiesel and biogas systems.”*

This project component pursues strengthening of the institutional framework to effectively support the deployment and use of bioenergy technologies by small and medium-size farmers. The direct beneficiaries of this component are: local farmers, municipality-based sector organizations, national agronomic institutions (including EEIH), energy and agricultural professionals. The institutional framework will be composed of three levels: (a) a national expert center; (b) inter-institutional support through training and education; and (c) pools of agronomists and bioenergy professionals working at the municipal level.

Co-funding for this component will be provided by EEIH (being the institution to host the national bioenergy expert center); by COSUDE, through its capacity building activities and pilot facilities under

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<sup>16</sup> Possible options will be explored in more detail during the PPG phase.

its BIOMAS II project; the municipalities, who will make available technical staff for farmer support; and UNDP. Project component 3 consists of the following outputs:

Output 1. Established national expertise center within EEIH on integrated bioenergy production to support the implementation of biodiesel and biogas systems in rural farms.

Output 2. Implemented national training and educational system on small-scale biodiesel and biogas production and use.

Output 3. Established networks of trained bioenergy professionals and local agronomic organizations in selected municipalities.

Output 4. Completed and disseminated Bioenergy technology case study database and manuals documenting best practices/lessons learnt from completed pilot demonstrations

**B.3. Describe the socioeconomic benefits to be delivered by the Project at the national and local levels, including consideration of gender dimensions, and how these will support the achievement of global environment benefits (GEF Trust Fund) or adaptation benefits (LDCF/SCCF). As a background information, read Mainstreaming Gender at the GEF.":**

The Project is expected to contribute directly to economic development in Cuba at all levels (individual farmers, cooperatives, private enterprises, municipalities, provinces and State) by releasing the energy potential of presently unexploited organic (biomass) resources as input for food production, industrial production and services. Given Cuba's large dependence on imported fossil fuels, local energy production using domestic resources, translates into direct savings of foreign currency<sup>17</sup>. Decentralized energy production and distribution systems are expectedly less vulnerable to the extreme climatic events (particularly hurricanes) and as such, are instrumental in adaptation strategies aimed at limiting the destruction of capital assets and keeping local economies afloat.

The secure supply of affordable (renewable) energy in the rural areas is an important enabling factor for local production processes, which are the basis for increased economic growth at the municipal level. Increased income levels and an enhanced quality of life in turn are a basic prerequisite to revert the migration trend from the rural areas to the the urban centers. As such, the Project indirectly contributes to the establishment of sustainable livelihoods in rural Cuba.

The technologies promoted by the Project specifically reduces the emission of global greenhouse gases and the environmental footprint of the primary sector. Improved agronomic practices and the incorporation of idle lands can further revert soil degradation processes, which are a direct benefit in terms of adaptation to climate change. The long-term sustainability of such benefits cannot be guaranteed by the Project, but must derive from sustained economic growth (at the local, and/or national level) for investment in local production systems and protective measures, and the availability of skilled human resources.

At PIF stage, no detailed assessment of gender aspects has been made. COSUDE's BIOMAS I project reports that women account for only 35% of the direct beneficiaries (640 out of 1,823), 14% of the newly created jobs; 37% of the local people trained are women. This indicates that the economic benefits of rural energy interventions would not be fully gender-neutral, male benefitting significantly more than female. The lower participation of women in training activities, suggests that labor distribution in the targeted sector is male-dominated, possibly in a similar proportion (37% women out of 100%). However, a detailed assessment would be needed in order to draw conclusions regarding gender-sensitivity of the proposed GEF Project. Further, enhanced local economic development may assist in preserving the integrity of rural families, as migration process are often highly gender-biased.

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<sup>17</sup> Oil imports account for approx. 20% of total imports by Cuba.

**B.4. Indicate risks, including climate change risks that might prevent the project objectives from being achieved, and if possible, propose measures that address these risks to be further developed during the project design:**

Risks	Likelihood	Mitigating Actions
Potential disagreements between technology developer and recipient on the terms and conditions of the technology transfer agreements	Moderate	Investors, suppliers and technology transfer experts will be made fully aware of the economic potential of bioenergy technologies to ensure they negotiate deals with full information and knowledge of benefits to be reaped by bioenergy technologies, looking for a balance between a flexible policy-push and market-pull environment.
The implemented technologies would not deliver the expected technical and economic benefits.	Low	A comprehensive assessment will reveal the most appropriate technological options for Cuba. Pilot projects in small- and medium-size farms will be monitored to identify eventual flaws and generate proposals for improvement. Case studies including analysis of success and risk factors will be documented and disseminated.
The regular supply of bioenergy feedstock may not be guaranteed for particular technologies (e.g. anaerobic digestion)	Moderate	The project will encourage long-term supply chain agreements for feedstock once the appropriate technologies for local use are identified, assessed and demonstrated.
Inadequate plant operation would jeopardize the efficient and cost-effective production of biogas and biodiesel	Moderate	Proper operation is a key factor for digesters and biodiesel production plants. The importance thereof will be highlighted throughout the project and end-users will be trained on O&M aspects.
Uncertainty over the resulting bioenergy technology institutional framework, conflicting political/market policies preventing the fruition of technology transfer	Low	Multi-stakeholder platforms will be consulted during the elaboration and presentation of technology assessments and legal studies, to ensure the potential for conflict, duplication or overlap between government agencies and their mandates is reduced, and ensure broad-based political backing
Maintenance services and technical assistance would not be available for end-users	Low	The project will promote the establishment of a local market for biodigesters and biodiesel production plants. The network of local industries, technicians and entrepreneurs will enable the users to access technical assistance at an affordable cost level. The small farmholders will receive additional backup from rural development programmes.
The necessary supply chain partnerships at the local and national levels may not take place, or lead to conflict	Moderate	The project will make an assessment of needs and critical success factors (feedstock supply, land availability, competitive industrial uses, food security) to be considered in order to forge partnerships for bioenergy technology developments
The inadequate economy of the technologies would inhibit the development of local markets.	Moderate	The offset of fossil fuels and electricity by itself provides a strong incentive for end-users to benefit from biogas and biodiesel technology. For smallholders, some financial incentives will remain necessary. The project will contribute to the development of local industries and service providers for construction, installation and maintenance.

**B.5. Identify key stakeholders involved in the project including the private sector, civil society organizations, local and indigenous communities, and their respective roles, as applicable:**

The project will be implemented by the “Estación Experimental Indio Hatuey (EEIH)”, which is an agronomic research institute ascribed to the Ministry of Higher Education (MES). The institute also coordinates and implements several components under the base project and has a 50-year track record in its field in Cuba. EEIH will coordinate the project with other entities and stakeholders, including:

- The Ministry of Science, Technology and Environment (CITMA): to coordinate the project with rural development strategies and climate change and environmental policies; to evaluate and select pilot investments; to interact with the GEF Focal Point at the Ministry.

- The Ministry of Trade and Foreign Investment (MINCEX): to facilitate the importation of equipment and coordinate with international cooperation organizations.
- The Ministry of Basic Industries (MINBAS): to define local, sector and national renewable energy strategies; to evaluate and select pilot investments; to implement training activities for stakeholders; to provide support for the installation, operation and maintenance of equipment; for dissemination of the technology among potential end-users; to evaluate the national potential of bio-energy options; and to carry out economic evaluations.
- With the Ministry of Economy and Planning (MEP) and the Central Bank of Cuba (BCC): to provide inputs for the development and implementation of policy and regulation to incentivate national markets for biogas and biodiesel; to establish financial mechanisms and incentives to stimulate these technologies in synergy with national programmes targeting the agricultural, farming and rural sectors; to identify opportunities to stimulate participation of the national industry in the design and production of biogas and biodiesel systems, and to provide technical support for installation and maintenance.
- With the Ministry of Finance and Prices (MFP): to define a pricing methodology for Jatropha nuts and for marketable products, including biogas, biodiesel, bio-fertilizer, co-products, and for electric energy produced from biomass and biogas.
- With the Ministry of Agriculture (MINAG) and the National Association of Small Farmers: to collaborate in the definition of supportive policies and regulation for biogas and biodiesel markets; to define financial mechanisms and incentives; to test and evaluate the operation of bio-energy systems by the target group under field conditions; to assist in training activities; to adapt and evaluate effluent management practices, the production and application of bio-fertilizers; installation and O&M aspects; end-user awareness and training; and economic evaluation of technologies. And:
- With the Ministry of Higher Education (MES): to implement innovation and local knowledge management strategies; to assess climate change benefits; to assess and select appropriate technologies; to participate in training activities and to accompany the design, installation, operation and evaluation process of pilot plants.
- National association of small farmers and the national stakeholder platform supported by the BIOMAS project.

#### **B.6. Outline the coordination with other related initiatives:**

The Government of Cuba (through MINCEX) assumes full ownership of international cooperation programmes in close dialogue with the agencies and national stakeholders. The optimum use of international financing sources is of direct interest for Cuba and has been declared a national priority. Strong ownership and proper coordination should guarantee the efficient use of funding resources, both for the Cuban Nation and the funding providers, including the GEF. Since some of the baseline projects, and other related initiatives, are presently being negotiated, details concerning coordination of activities and implementation arrangements, will be ascertained and confirmed during the PPG stage. However, in addition to the existing potential for North-South collaboration per the ongoing Switzerland and EU-funded baseline initiatives, the project will seek South-South cooperation efforts with Mexico, Brazil and other countries with experience in bioenergy technology during this phase.

UNDP has actively acted as an important channel for bilateral and multilateral agencies to coordinate and/or implement individual initiatives and programmes and continue to play this role in the development and implementation of the proposed Project.

#### **C. DESCRIBE THE GEF AGENCY'S COMPARATIVE ADVANTAGE TO IMPLEMENT THIS PROJECT:**

##### **C.1. Indicate the co-financing amount the GEF agency is bringing to the project:**

At PIF stage the UNDP Country Office (CO) has committed support for project preparation and execution to a cash amount of US\$50,000. UNDP CO further provides in-kind and cash support during the project preparation phase. The UNDP Regional Coordination Unit (RCU) for Latin America and the Caribbean (based in Panama) provides technical technical backstopping as well as support during project implementation and monitoring. The RCU counts with highly experienced staff in the field of climate change and energy programmes, and counts with a pool of associated experts.

**C.2. How does the project fit into the GEF agency’s program (reflected in documents such as UNDAF, CAS, etc.) and staff capacity in the country to follow up project implementation:**


The presented UNDP/GEF Project is aligned with the following UNDAF outcome “Strengthened national capacities for implementing environmental policies and strategies and providing energy services, with a view to promoting sustainable development”. The Project is instrumental to achieve country programme outcome (b): “Strengthened national capacity for promoting access to sustainable energy services, developing and implementing measures and policies aimed at mitigating and adapting to climate change.” The project further contributes to the country outcome (d): “Strengthened national capacity for promoting environmental clean-up and sustainable management of water resources, reflected in an improvement in the Cuban people’s quality of life.”

**PART III: APPROVAL/ENDORSEMENT BY GEF OPERATIONAL FOCAL POINT(S) AND GEF AGENCY(IES)**

**A. RECORD OF ENDORSEMENT OF GEF OPERATIONAL FOCAL POINT (S) ON BEHALF OF THE GOVERNMENT(S):**

NAME	POSITION	MINISTRY	DATE (Month, day, year)
Enrique Moret Fernandez	Director, Department for International Affairs, Ministry of Science Technology and Environment (CITMA)	MINISTRY OF SCIENCE TECHNOLOGY AND ENVIRONMENT	12/23/2011

**B. GEF AGENCY(IES) CERTIFICATION**

<b>This request has been prepared in accordance with GEF/LDCF/SCCF policies and procedures and meets the GEF/LDCF/SCCF criteria for project identification and preparation.</b>					
Agency Coordinator, Agency name	Signature	Date (Month, day, year)	Project Contact Person	Telephone	Email Address
Yannick Glemarec UNDP/GEF Executive Coordinator		January 18, 2013	Raul Alfaro-Pelico, Regional Technical Advisor EITT	+5073024500	raul.alfaro@undp.org