



United Nations Development Programme
GLOBAL ENVIRONMENT FACILITY



Date: 29 September, 1999

To: Mr. Kenneth King
Assistant Chief Executive Officer
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Pages: 11

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From: Rafael Asenjo
Executive Coordinator

Subject: PDF A Funding for Medium Size Project:

Please find attached for your review and comments a PDF Block
A request for funding entitled: **"Obtaining Biofuels and Non-wood
Cellulose Fiber from Agricultural Residues/Waste"**

We would appreciate receiving your comments no later than October
13, 1999.

Thank you.

Medium Size Project Clearance Sheet – PDF A

(the template for this form can be found on L:\Medium Size Projects\Administration\Templates)

Project Title	Obtaining Biofuels and Non-Wood Cellulose Fiber from Agricultural Residues/Waste		
Country (ies)	Peru	Focal Area	Climate Change
Regional Bureau	RBLAC	PIMS Number	1674
Task Manager	Nick Remple <i>NR</i>	GEF Amount (PDF A)	US \$ 22,950

PDF A Circulation

Clearance	Date	Signature
Technical Advisor Clearance (including verification of govt support letters)	30/9/99	<i>[Signature]</i> (technical advisor)
Programme Support Unit Clearance (including verification funds available)	1/10/99	<i>P. Chan</i> (PSU) *
Distributed to IA's and GEFSEC		(task manager)
Comments Received UNEP		(task manager)
Comments Received World Bank		(task manager)
Comments Received GEFSEC		(task manager)
Endorsed by UNDP GEF Executive Coordinator		(UNDP GEF Exec. Coordinator)

UNDP Project Document Information

UNDP Project Number

Clearance	Date	Signature
Technical Advisor Clearance (including verification all GEFSEC & IA technical comments addressed)		(technical advisor)
Programme Support Unit Clearance of UNDP Budget		(PSU)
Verified that all the above data is entered in PIMS		(task manager)
Endorsed by UNDP GEF Executive Coordinator		(UNDP GEF Exec. Coordinator)
Delegation of Authority Sent to Resident Representative / Executing Agency		(task manager)

* Budget format needs to be revised at prodoc stage.

! Note and attach e-mail or fax if not physically signed

**MEDIUM-SIZED PROJECT CONCEPT PAPER
REQUEST FOR BLOCK A PDF GRANT**
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1. Project name: Obtaining Biofuels and Non-Wood Cellulose Fiber from Agricultural Residues/Waste	2. Proposed GEF Implementing Agency: UNDP
3. Country or countries in which the project is being implemented: Peru	4. Country eligibility: Under Financial Mechanism of UNFCCC (ratified 7 June 1993)
5. GEF focal area(s): Climate Change	6. Operational program/Short-term measure: OP 6 "Promoting the adoption of renewable energy by removing barriers and reducing implementation costs"
7. Project linkage to national priorities, action plans, and programs: <p>The proposed project aims at incorporating a new fuel, namely sugarcane trash and other agricultural residues, into the national energy balance. The expected outcome of the project is one where utilization of sugarcane trash as a commercial fuel for heat – as well as for combined heat and power generation - has become a financially self-sustainable and commercially competitive venture in the Peruvian energy market, thus replacing fossil fuels and reducing greenhouse gas emissions. This market transformation is closely related to various national priorities with both local and global benefits.</p> <p>The project will promote the energy sector policy goals as formulated by the Ministry of Energy and Mines. This is true especially as referred to satisfying growing energy demand while maintaining energy prices low, improving energy security by diversifying supply, promoting competition and private sector participation in power generation and improving the sector's environmental performance.</p> <p>The proposed project will also result in a more competitive sugar industry by lowering its energy costs and introducing new revenues in the form of power sales. This will increase the capacity of the industry to export, which, together with decreasing demand for fuel imports, will have a positive impact on Peru's balance of payments.</p> <p>The project will transfer environmentally sound technology to Peru and build capacity to manage integrated sustainable solutions for sugar and other agricultural industries. Incorporation of agricultural residues as commercial fuel to the national energy balance will broaden the potential to satisfy growing energy demand and to improve business competitiveness.</p> <p>The National Council for the Environment (CONAM) chairs the National Committee for Climate Change and is responsible for drafting the first National Communication to the Parties of UNFCCC. Among the activities undertaken to prepare the national strategy for climate change, preliminary studies on mitigation options have been carried out. Among the options, increased use of renewable energy and substituting cleaner fuels for diesel and residual oil in heat and power generation is given high priority.</p>	

8. Status of national operational focal point review (dates):

Submitted:

Acknowledged:

Endorsed:

9. Project rationale and objectives:***Rationale***

Satisfying the increasing domestic and industrial demand for energy is a priority for any development strategy in Peru. Within this framework, the importance of using the most efficient technologies and a wide variety of fuels is emphasized. This is to assure lowest possible cost for energy supply and improved energy security through diversification. The proposed project expects to contribute to these objectives by replacing fossil fuels with low-cost biomass in industrial heat and power generation.

The actual installed capacity for electricity generation in Peru is about 5,000 MW. According to the Referential Electricity Plan elaborated by the Ministry of Energy and Mines, about 300 MW of additional power has to be installed annually up to 2013 in order to satisfy growing demand. The Referential Electricity Plan considers different alternative scenarios to satisfy the growing demand. Depending on the scenario, the growth in power capacity is expected to correspond to natural gas (42% - 66%), hydropower (12% - 34%), diesel oil (14% - 16%) and coal (7% - 8%). Agricultural waste and fuelwood are not currently considered as commercial fuels in Peru.

The Peruvian power sector is characterized by vertically separated generation, transmission and distribution sectors and increasing private sector participation in all these activities. Access to the transmission grid is free with regulated tariffs. The laws regarding the commercialization of electricity state that the power plants, which offer the lowest price have the preference to attend demand from the grid.

Apart from the electricity, fuel use for heat generation is growing fast in the industrial sector. The agroindustry and the fishing industry especially are increasingly using diesel and residual oil to meet their growing energy demand, both for power and for heat.

Currently most agricultural and forest waste is burned in the fields without any energy recovery. The industrial sector fails to attribute any potential commercial value in terms of energy to this waste. In accordance with preliminary estimates, in Peru's coastal region, sugarcane foliage, cotton stalks, rice hulls and straw are burnt on an annual basis in amounts that could sustain a plant operation of nearly 600-700 MW, during 7,000 hours/year. The value of sugarcane trash alone (excluding bagasse) annually left on fields has an energy value of 510,000 toe.

The majority of countries that produce sugarcane have a seasonal harvest. The harvest period in these countries usually lasts 120 - 160 days. Peru has extraordinary climatic advantages for sugarcane cultivation. Because of the lack of rainy season on the coast, harvesting can continue throughout the year which makes the use of cane trash in power generation a feasible alternative.

At present, in Peru 7.5 million metric tons of sugarcane are harvested annually. It is expected that in a 4-5 year period, the amount will rise to more than 10 million tons. Considering an average harvesting period of 300 days/year, the volume of processed sugarcane is around 25,000 MT/day. This amount would increase to 33,000 - 35,000 MT/day in coming years.

The sugar industry in Peru is characterized by slow technical change and maintains the same basic technical criteria for the primary treatment of raw material. New investment in conventional technology has little impact in terms of productivity. While Peru used to be self-sufficient in, and an exporter of sugar; today it must import it. The crisis of the sugar industry results mainly from lack of technological innovation and willingness to diversify production. Sugarcane mills that are competitive in today's global market are

those which have an integrated approach to business: apart from sugar they produce and sell bagasse/fiber, alcohol and power.

The proposed project aims at incorporating sugarcane trash and other agricultural residues as commercial fuels into the national energy balance. The expected outcome of the project is one where utilization of sugarcane trash as a commercial fuel for heat and power generation has become a financially self-sustainable and commercially competitive venture in the Peruvian energy market.

In the following table, the costs of the different fuels and the corresponding CO₂ emissions are presented.

Fuel	Fuel Cost US\$/toe	CO2 emissions tCO2/toe
Diesel	285.63	2.90
Residual	134.85	3.24
Natural Gas	104.93	2.35
Coal	73.41	3.98
Foliage	15.50	0.00

(NOTE.- The indicated prices for diesel and residual oil correspond to Peru's actual selling prices in factory without taxes. The natural gas price considered corresponds to a projection (USD 2.50 per 1,000 ft³) that includes transportation costs, also without taxes. The coal price is calculated from the average CIF value per MT during the past 3 years. The foliage price includes the treatment cost for its harvest, transport, separation and moisture reduction up to 10% using the Monda technology. The CO₂ emissions are based on IPCC reference values. See Annex I for details on foliage costs).

It can be seen that sugarcane foliage is a highly cost-competitive fuel. In heat generation, it could compete with residual and diesel oil also when not used in the sugar mill and some additional transport and handling costs are taken into account. Power plants using it would easily receive priority in electricity dispatch. This is true even if foliage power plants had a lower efficiency and a higher investment cost per kW installed than e.g. gas-fired combined-cycle plants.¹ Different barriers, however, prevent this from happening. The proposed project will remove these barriers in order to incorporate sugarcane foliage into the energy system in a sustainable manner. This will also facilitate future introduction of other biofuels, such as cotton stalks, rice hulls and straw.

Objective

The proposed project intends to reduce future growth of GHG emissions from heat and power generation by removing barriers to commercial use of sugarcane trash as biofuel and thus substituting for fossil fuels.

The project would result in production of approximately 153,000 toe of biofuels annually, part of which would substitute for fossil fuels and part for bagasse. The reserved bagasse can be used to replace wood fiber in paper production. Replacing fossil fuels would reduce 196,000 – 477,000 metric tons of CO₂ emissions annually. The long-term objective of the project is to further promote investment in biofuel-based cogeneration of energy, which would result in additional GHG reductions. The possibility to repeat the proposed project in other countries of the region, for example, in all those that produce sugarcane, represents an additional justification.

The project objective will be achieved by transferring the necessary technology and know-how, facilitating fuel-switching and installation of commercial cogeneration plants using sugarcane trash in Peru and

¹ As an example: the combined fuel and investment cost for foliage plant and natural gas combined-cycle plant, taking efficiencies of 30% and 45% and installation costs of US\$1,300 and US\$700 per kW installed respectively, result in € 2.7/kWh for foliage and €3.2/kWh for gas. (Discount rate 10%, plant life 30 years, 6000 hours of operation yearly, O&M costs are omitted.)

removing the barriers related to institutional capacity and lack of information. As the sugarcane foliage is traditionally burnt in the field, it is necessary to modify the whole process from harvesting to preparation of the cane in order to use the foliage as a biofuel.

Innovative technology called Monda, owned and presented by the Swedish company Salix Maskiner AB, has been identified as uniquely suitable for whole-cane harvesting and subsequent processing of sugarcane and foliage in the Peruvian context. It has several advantages over other whole-cane harvesting and treatment technologies, which make the foliage-based biofuel competitive with traditional fuels. (For the description of the Monda Technology and its applications, see Annex II.) The proponent of this project, Monda SAC, has the right to license the Monda Technology in Peru and the rest of Latin America. The subcontracts for manufacture of the components will be awarded based on competitive bidding. It is expected that natural competition for Monda technology will follow the demonstration of commercial viability of obtaining biofuels from sugarcane trash.

The operation of Monda Technology equipment has been field tested in Spain on a pilot and industrial scale. Several studies took place afterward in Peru to evaluate the possibility of installation of the mentioned technology. In comparison to conventional technology, studies demonstrated an increase of 18 – 20% in sugar production and a cost reduction of 20% in production of granulated sugar, while providing some 59 toe of biofuel (dry foliage and pith) per ton of sugarcane processed (see Annex III for details).

10. Expected outcomes:

The project will last 3 years and executed in two phases. Outcomes of the first phase (1 year) will be:

- Transfer of the technology (process engineering and detailed engineering) related to the Monda Pre 1250 module;
- Construction and start up of the operation of the first Monda Pre 1250 module;
- Obtaining competitive priced biofuels with respect to fossil fuels and demonstrating the viability of reducing electricity and steam generation costs by substituting foliage for fossil fuels; and
- Demonstration of the viability of reducing the relative price and improving the quality of virgin cellulose fiber contained in the sugarcane, as a potential substitute for virgin cellulose fiber from pine and broad-leaved trees in the pulp and paper industry.

Second phase (years 2 and 3) expected outcomes are:

- At least five Monda Pre 1250 modules installed for the primary treatment of sugarcane biomass, with a total capacity of 7,500 MT/day and 2,250,000 MT/year of sugarcane and to produce about 300,000 MT of sugarcane dry foliage, which together with the pith equals about 153,000 toe;
- A portfolio of investment projects for cogeneration based on the use of biofuels, especially in production activities such as agriculture, agroindustry and fishing industry;
- A portfolio of investment projects for the installation of 250 MW of biofuel-based power plants to sell electricity to the grid;
- Increased awareness of the benefits and potential of using agricultural and forest residues as a cost-competitive commercial fuel; and
- Trained professionals (engineers, technicians, economists) in new technologies for the use of agricultural and forest residues with the aim of energy generation and industrial diversification.

Agroindustrial fuel use in Peru consists mainly of bagasse, diesel and residual oil, and sector specific emissions can be estimated at 1.28 tCO₂/toe. The fishing industry uses diesel and residual oil almost exclusively and specific emissions are about 3.12 tCO₂/toe. The actual global impact of the project depends on the extent to which biofuels replace fossil fuels and to what extent bagasse (the impact of substituting bagasse for wood cellulose fiber is not taken into account). If, as a result of the proposed project, half of Peru's current sugarcane production were harvested using methods similar to Monda technology, 255,000 toe of biofuel would be obtained annually. If this fuel were to be used solely in agroindustry replacing the aforementioned fuel-mix, emissions of 326,400 tCO₂ would be avoided annually. In ten years, this would

mean reduction of carbon emissions by 890,181 t_c as a result of a GEF investment of US\$ 750,000 indicating cost-effectiveness of US\$ 0.84/t_c. It is expected that the global impact will be even higher as the commercialization of sugarcane trash will facilitate the commercialization of other biofuels. Furthermore, it is likely that biofuels will be utilized also in other sectors (e.g. fishing industry) with higher dependence on fossil fuels.

11. Planned activities to achieve outcomes:

GEF funding will be required in the first instance to remove financial barriers to transfer of technology, to retrofit it for Peruvian conditions and to build the first equipment for harvesting and handling of sugarcane. The equipment will be sold on purely commercial terms to an interested party. The GEF is asked to assist in establishing the contractual relations between Monda SAC and Salix Maskiner AB and between Monda SAC and the buyer of the equipment. Furthermore, the financial barrier related to the demonstration nature of the project, i.e. incremental risk, needs to be removed by GEF. This may include such instruments as guarantees, bridge financing, facilitating the negotiations with financial institutions, helping with leasing arrangements, etc.

The exact financial arrangement of the project will be a result of the PDF activities. It must be emphasized, however, that the project is expected to be financially self-sustainable. Any GEF funding needed to for guarantees, bridge financing, etc., will be returned to the project with interest earned. These funds will be subsequently used in the second phase of the project to remove other barriers related to information dissemination, training, institutional strengthening, etc. It is anticipated that after the first commercial equipment has been installed, financial barriers have been removed and the successive new equipment can be financed without further GEF involvement.

For the definitive design of the project, a Project Development Facility (PDF Block A) funding is requested. The PDF activities are enlisted in section 13.

First year (Phase I) planned activities are:

- Complete the design of detailed engineering related to modifications and adjustments of some parts/components of Monda Pre 1250 equipment;
- The manufacturing of Monda Pre 1250 equipment and the spare parts that must be included in the supply of the first module to be installed in Peru;
- Development of the civil engineering work required for the installation of Monda Pre 1250 module;
- Installation, running and testing of the operation of Monda Pre 1250 module during three months period;
- Transfer of the equipment to the purchaser;
- Analyze and publish the scientific and technical information related to the tests of the equipment, including environmental impact of the utilization of agricultural and forestry waste as renewable energy resources (e.g. the impact of whole-cane harvesting on the fertilizer use in sugarcane fields) and the project's long-term contribution to the mitigation of GHG emissions resulting from diffusion/replication;
- Feasibility studies for the partial installation of the Monda Technology in the sugar industry of Peru. Three studies will be carried out for sugar mills with different processing capacity (less than 1,000MT of sugarcane per day, 1,000 MT - 2,000 MT/day and 3,000MT- 4,000 MT/day);
- Negotiations for the establishment of cooperation links with national and foreign institutions specialized in research and development of renewable energy technology, and with financial institutions interested in promoting investments in clean energy and industrial diversification;
- Interviews with entrepreneurs and business organizations to collect data on problems relating to energy supply and cost (with more emphasis placed on the energy cost problem), importance assigned to energy cost/supply problem, knowledge of new technologies for energy generation and cost/benefit of the investment in more efficient and clean technologies; and
- Estimation of the contribution to preservation/increase of CO₂ sink capacity (natural forest area and forest plantation), as a consequence of reducing the supply of virgin cellulose fiber to the pulp and

paper industry.

Activities of the II Phase (years 2 and 3):

Financed by GEF:

- Assessment of biomass resources;
- Assistance in incorporating biomass as a commercial fuel into the national energy balance and supply forecast;
- Information dissemination and promotion of the use of biofuels; and
- Training of national professionals in new technologies for the use of agricultural and forest residues for energy generation and industrial diversification.

Financed by the Project Proposer:

- Installation of at least five Monda Pre 1250 modules for the primary treatment of sugarcane biomass;
- Promotion of investment projects with high technology equipment for cogeneration based on the use of biofuels, especially in production activities such as agriculture, agroindustry and fishery industry; and
- Identification and promotion of a set of investment projects for the installation of biofuel-based power plants to sell electricity to the grid.

12. Stakeholders involved in project:

During the first year of the project the group directly involved in the project will be comprised of the project proponent, Monda SAC, the supplier of the technology (Salix Maskiner AB), sugarcane mills interested in the new technology, small sugarcane farmers, national institutions in charge of environmental policy and multilateral technical cooperation agencies.

At the same time, during the first year, the project will seek to involve a major number of stakeholders (universities, agroindustrial organizations, NGOs, farmer unions, public institutions (MEM, CTE, OSINERG, etc.). To achieve this the aim it will organize events (meetings and seminars) for the presentation and dissemination of existing opportunities to generate clean energy from renewable sources at market conditions

PART II - INFORMATION FROM PROPOSAL (ACR/MPD)

13. Activities to be Financed by the PDF A

- Design and negotiation of contracts for the transfer of technology and for the manufacture of equipment. This task requires trips to Sweden to finalise the contracts and for the selection of companies for the manufacturing of the Monda technology equipment;
- Identification and negotiation with at least two companies in Peru as potential users of the Monda Technology;
- Design of Terms of Reference for the investment opportunity study for the supply of the Monda Technology. Development of at least two studies for the application of the Monda Technology in sugarcane mills in Peru oriented to producing biofuels;
- Identification of Private and Public institutions that could be interested in participating in the project. Realisation of workshops for the presentation and gathering of criteria and suggestions related to willingness to efficiently utilize agricultural residues/waste as biofuels. As a part of this task one or two institutions will be selected as co-directors for the implementation and development of all the tasks/activities proposed for the 2nd and 3rd years of the project;
- Selection of local financial institutions. Design of the scheme for the financing of the first Monda equipment to be sold in Peru and the respective modality for the GEF support during the first year of the project (as bridge loan, collateral guarantee, etc.); and
- Identification and establishment of contacts with financial institutions (multilateral, private and bilateral co-operation) in order to obtain financial support for the required investment in biofuel power thermal plants. This type of investment possibilities will be evaluated and addressed as part of the

second and third year's project activities.

14. Expected outputs and completion dates of the PDF A

- A contract for Monda Technology transfer/license referred to the equipment for harvest of sugarcane without burning (Bundler model), and the equipment for sugarcane preparation and production of biofuels (Monda Pre 1250 model). Registration of the contracts with the proper legal authorities in Peru and in the country of origin of the technology. This task is to be finished 60 days after the approval of PDF-A;
- Proposal of contracts by Peruvian and/or foreign companies for the construction, supply and start up of the Bundler and Monda Pre 1250 equipment. This task also to be finished 60 days after the approval of PDF-A;
- Letter of intent for the purchase of the Monda Pre equipment accepted by the interested companies. This task to be finished 30 days after the approval of PDF-A;
- Two case studies of Peruvian companies regarding the expected technical, economic and financial results of the application of the Monda Technology for the harvest and preparation of non-burned sugarcane. These studies to be finished 60 to 90 days after the approval of PDF-A;
- A list of companies interested in the use of biofuels for energy generation. Approval of cooperation terms with institutions and a list of them (companies, NGOs, universities, public sector) willing to participate as collaborators in the development of project activities;
- A preliminary document related to information regarding financing opportunities from multilateral sources and private sources for clean energy projects and a working scheme for the negotiation of financial resources (from public, private, local and foreign institutions) for investments in thermal plants based on the use of biofuels;
- Arrangements for the financing of the first Monda equipment with a selected local financial institution; and
- Final Medium Size Project Brief "Obtaining Biofuels and Non-Wood Cellulose Fiber from Agricultural Residues/Waste" to be submitted to GEF.

15. Information on project proponent:

Monda SAC is a recently established small enterprise. Its objective is to promote the development and dissemination of new technologies to obtain biofuels, to generate clean energy and to promote industrial diversification.

The owners and technical/economic directors of Monda SAC, and their foreign advisors are senior professionals and enterprises (Swedish enterprises Wilstrand Innovation AB, TPS Termiska Processer AB, Salix Maskiner AB) with long experience in direct management, advice, research and promotion of production activities in the fields of energy, agroindustry and equipment manufacturing.

Monda SAC is the continuation of work initially started in 1990 by the project proponent associated with Swedish firms mentioned above to look for technological innovation in the pulp and paper industry, sugarcane industry and generation of clean energy. Since 1990, aside from technological research and development, the project proponent has carried out in Peru several studies related to opportunities for investment in new technology in the mentioned industries (see Annex III).

16. Estimated budget (in USD):**FULL PROJECT:**

	First year	Second and Third Years	TOTAL
GEF:	USD 750,000		USD 750,000
Co-financing:	USD 300,000	USD 4,500,000	USD 4,800,000
TOTAL:	USD 1,050,000	USD 4,500,000	USD 5,550,000

PDF A BUDGET:

COMPONENT	GEF	MONDA SAC	TOTALS
1.0 Personnel			
1.1 Project Coordinator	7,950.00		7,950.00
1.2 Consultants	4,000.00		4,000.00
1.3 Assistant		1,200.00	1,200.00
1.3 Administrative support		1,500.00	1,500.00
2.0 Services			
2.1 Legal Advice in Peru	1,500.00		1,500.00
2.2 Legal Advice in Sweden		3,000.00	3,000.00
2.3 Transportation/studies field work	500.00		500.00
2.4 Contracts registration cost		500.00	500.00
3.0 Travel			
3.1 International			
- Ticket Lima/Stockholm/Lima	3,400.00		3,400.00
- DSA 10 days	2,000.00		2,000.00
3.2 National			
- Tickets		600.00	600.00
- DSA (USD 100 day per 30 days)	1,500.00	1,500.00	3,000.00
4.0 Events			
4.1 Workshops	600.00		600.00
4.2 Conferences		350.00	350.00
5.0 Miscellaneous			
5.1 Communication (telph., fax, E-mail, cour	1,000.00	500.00	1,500.00
5.2 Office materials	500.00		500.00
TOTAL PDF-A	22,950.00	9,150.00	32,100.00

ANNEXES:

- Annex I** Cost of Sugarcane Follage as Fuel (In Spanish)
- Annex II** Tecnología Monda (In Spanish)
- Annex III** Monda Technology: Background, Scope and Summary of the Evaluation of its Application in Peru (In Spanish)



Lima, 02 de setiembre de 1999

Carta No. 1504-99-CONAM/SE

Doctora
Kim Bolduc
Representante residente
PNUD-Perú
Presente -

Tengo el agrado de dirigirme a usted para expresar el respaldo de CONAM en su condición de punto focal operacional del GEF en el Perú, al Proyecto "Utilización de residuos agrícolas para elaboración de combustibles", presentado por MONDA SAC.

Sin otro particular, quedo de usted.

Atentamente,

Paul Remy
Secretario Ejecutivo

CONSEJO NACIONAL DEL AMBIENTE

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