

ENERGY/NATURAL RESOURCE SUB-SECTOR
STRATEGY UP-DATE

February 1986

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ENERGY/NATURAL RESOURCE SUB-SECTOR UPDATE

1.0 BACKGROUND: ENERGY/NATURAL RESOURCES IN THE AGRICULTURAL CONTEXT

1.1 Agriculture's Role in Madagascar's Economy

Agriculture is the dominant sector of the Malagasy economy: it employs 85% of the population, accounts for 80% of export earnings, and contributes about 40% of gross domestic product. Over the last five to six years, agricultural production has fluctuated widely but the overall trend has been static, in contrast to the strong upward growth trend of the 1960s and early 1970s.

As a result, production has increased more slowly than the rate of population growth. The impact on Madagascar's balance of payments has been particularly serious; food imports have become a heavy and increasing burden on foreign exchange reserves, while export earnings have fluctuated widely. In short, the agricultural sector is not currently playing the dynamic role which it could and should.

1.2 Key Constraints in the Agriculture Sector

The World Bank's Agriculture Sector Memorandum of June 30, 1983 summarizes the key economic, institutional and technical issues facing the development of Madagascar's agriculture sector. Briefly, they are:

- o Pricing and marketing policy: Government controls over prices and marketing of key agricultural commodities have introduced many distortions and contributed to declining production and supply problems;
- o Production related services: Key farmer services are weak and declining in effectiveness; these include veterinary services, irrigation management, research, extension, credit, input supply, and the forestry service. Organization and management of financial and material resources have been weak. Research is virtually at a standstill. In addition, the deterioration of producer-related infrastructure (roads, the transport fleet, agro-processing facilities, irrigation works) has had serious repercussions for production;

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- o Resource allocation and management: Public sector investment in agriculture expanded in the late 1970s, yet the productivity of investments is poor, primarily because public sector resource management is weak at every level including planning, programming, budgeting, accounting, monitoring and evaluation. Basic aspects of financial management such as cost recovery have been largely neglected. Sector managers were ill-prepared to handle the stringent cutbacks in resources allocated to the sector from 1981 on and, as a result, priority projects and services are inadequately financed;

- o Sector institutions: Many problems stem from the weakness of the institutions involved. Both, in the Ministries primarily concerned (the Ministry of Agriculture-MPARA, and the Ministry of Forestry and Livestock-MPAEF), and the 90 plus agricultural parastatals, there are problems of organization and structure, training, personnel management and materials which greatly reduce the effectiveness of the institutions concerned.

- o Environmental degradation: It is estimated that as much as one million hectares per year are lost to productive agriculture in Madagascar through soil erosion. In the past, GDRM measures to control erosion and its underlying causes (overgrazing, uncontrolled bush fires, clearing for agriculture and fuelwood collection) have been ineffective tending to focus on unenforceable administrative regulations, publicity and some "curative" measures such as firefighting squads and communal afforestation programs. For the most part, measures to address soil erosion problems were not included in GDRM's land use planning and agriculture extension efforts where the key to long term sustainable agricultural productivity rests.

1.3 GDRM's Progress to Date in Agricultural Reform

In order to address the above issues, the GDRM has been acting along new agricultural policy lines giving grounds for some optimism about the future. The World Bank, in its Forestry III draft appraisal report, cites the following:

"In 1982, under the leadership of a new Minister, the agriculture ministry began to tackle the most flagrant problems it faced. Over the last three years, slow but solid progress has been achieved. On pricing and marketing, rice and beef have been substantially deregulated; significant increases in prices and improvements in price setting mechanisms have been

made for cotton. Major studies on rice and export crops, designed to provide the basis for further decisions on pricing and marketing issues, have been recently completed and action plans are being elaborated.

On production services, input supplies have been improved, veterinary services have been decentralized, and a pilot effort to revitalize extension services is underway.

On resource allocation and management, departments responsible for finance and administration have been established in the ministries, and a thorough appraisal of the investment program has been done, leading to a combing out of non-priority and non-viable projects.

On sector institutions, the Ministry of Agriculture was reorganized in 1983 to regroup the disastrous, ill-planned decentralization of 1979, thus enabling the Ministry to start on a series of ambitious institution building efforts. Unfortunately, the ministry was divided in two in 1983, and a new ministry of livestock and forestry (MPAEF) created. This has resulted in some teething problems but the new ministries are now settling down and are carrying out some self-appraisal. For example, MPARA's payroll was reduced by 3,000 surplus ministry employees, consultant reviews of ministry structures were carried out and are to be implemented; a preliminary review of training needs has been undertaken and the IDA report on parastatal issues has been discussed and its major recommendations accepted.

Implementation of some management audits and of rehabilitation and rationalization proposals is underway, and some management contracts have been signed with private firms; ISNAR has completed a study on agricultural research which includes recommendations for improved management and organization, and a good start has been made on implementation."

2.0 THE ROLE OF THE ENERGY/NATURAL RESOURCE SUB-SECTOR IN AGRICULTURAL PRODUCTION AND REHABILITATION

From the above, it is obvious that traditional agriculture production issues in Madagascar are slowly beginning to sort themselves out. As a result, many Malagasy planners and technicians are starting to turn their attention to agriculture's companion sectors of forestry, energy, natural resources and the environment. While rarely cited explicitly as a priority objective in past strategy statements, energy/natural resource contributions to increasing agricultural production while maintaining environmental stability and biological diversity, have recently emerged as a keen concern to the Malagasy Government.

2.1 Natural Resource Influences

The need for increased attention to soil conservation is a prime example. Madagascar has one of the highest erosion rates in the world, due primarily to uncontrolled clearing for agriculture and fuelwood production and/or uncontrolled bush fires combined with overgrazing. As previously stated, it is thought that over one million hectares of arable land are lost annually through soil erosion and resulting declines in soil fertility/cation exchange capacity.^{1/} At one research site (Ambatolampy), Malagasy scientists estimated that 262 tons of soil are lost each year due to erosion.^{2/} As 80% of Madagascar's land base is thought to be subjected to one form of erosion or another, the amount of soil lost each year is staggering. Gully formation has been rampant in the country's highly erodible soils and has resulted in immediate needs such as rehabilitation of areas adjacent to major roads; an extremely costly and difficult operation to carry out.

In addition to the loss of valuable land and soil resources, the impact of this high rate of erosion on agricultural productivity "downstream" can be considerable. The Lac Alaotra region, Madagascar's premier rice production scheme, annually loses up to 3000 hectares of rice paddy due to siltation and sand deposition resulting from erosion within the lake's watershed.^{3/} This is often more than the total of new paddy brought into production in the scheme in any one year. Silt deposition in the country's canals has led to decreased water availability in the irrigated rice schemes, favors aquatic weed growth and requires large recurrent expenditures in terms of canal maintenance. Rice is not the only crop affected. Manioc production has decreased from 10 tons per hectare to a current level of 5-6 tons per hectare because of nutrient loss through erosion and leaching.^{4/}

Madagascar's extensive shifting agriculture or "tavy", is also being called into question by many Malagasy authorities. Shifting agriculture, for upland rice production, and for corn, as a result of recent GDRM promotion, accounts for the loss of 200,000 hectares of forest cover each year in some of the country's most important watersheds.^{5/}

^{1/} The World Bank, "Madagascar Agriculture Sector Memorandum", 1983, Washington, D.C.

^{2/} Repoblika Demokratika Malagasy, Commission Nationale de Conservation pour le Developpement Durable, Rapport de la Sous Commission I, "Erosion, Conservation des Eaux et des Sols, Politique de l'Arbre", 1985, Antananarivo

^{3/} Ibid.

^{4/} Ibid.

^{5/} Ibid.

While this practice was acceptable when population levels were lower and fallow periods longer, increased population pressure in certain areas has reduced fallow periods to the extent that rice yields are now less than 300 kg/ha compared with 800 kg/ha on virgin sites and 3-4 tons/ha on irrigated sites.^{6/} Moreover, continued farming in these degraded areas without following prescribed rotations and fallow periods allowing for nutrient recycling, can eventually render these areas completely sterile.

Malagasy officials are therefore beginning to question the acceptability of these yields/practices given the large increases in socio-economic and financial costs resulting from environmental instability.

2.1.1 Influences on Biological Diversity

While the decline in agricultural productivity resulting from natural resource deterioration is problem enough, Madagascar's situation is even more bleak when it is combined with a concurrent loss in biological diversity as the country is now experiencing. The World Wildlife Fund, in their Madagascar briefing paper, reports the following:

"Madagascar has been separated from the African mainland for perhaps as long as 180 million years, and has evolved in isolation for at least 30-40 million years. As a result, Madagascar's spectacular flora and fauna is a unique evolutionary experiment, unlike that found anywhere else in the world and possessing what are probably the highest levels of species endemism of any country. As examples, 93% of Madagascar's 40 lemur species and sub-species, 81% of its flowering plant species, 95-99% of its reptiles and 148 out 150 of its frogs are endemic, and this endemism extends to the generic and even family levels in many cases. Owing to its unusual climate, Madagascar also has a wide variety of ecosystems, ranging from the spectacular spiny deserts in the south to dry deciduous forests in the west to moist tropical rain forests on the eastern escarpment, each with its own fauna and flora and each facing a wide variety of threats.

More importantly, because of the great variety of species and ecosystems and the very limited extent of many forest formations, the destruction of a few hundred hectares in Madagascar can have a much more devastating effect on species diversity than in most other parts of the world. Indeed, one need only look at what has already been lost in Madagascar to realize what could very well happen in the future.

^{6/} Ibid.

People arrived on the island 1,500-2,000 years ago, and over the next thousand years succeeded in wiping out all of the elephant birds, at least two species of giant tortoise, a pygmy hippo, an armadillo and at least seven genera of lemurs, all of them larger than the living lemur species and including one that grew to be as large as a female gorilla.

The factors that brought about these extinctions are still in operation, and could very well result in the loss of one of the most spectacular natural wonders of our planet before the turn of the century."

2.2 Energy Influences

2.2.1 The woodfuels crisis

An already serious problem is further compounded by the fact that Madagascar, like so many other countries, is facing a woodfuels crisis. Clearing for agriculture and cutting down forest resources to supply fuel needs are depleting forests faster than they are being replenished. While the woodfuels problem requires additional analysis, it is thought that indiscriminate and uncontrolled cutting of trees by commercial operators and farmers and wastage of wood through inefficient charcoal making are major contributors to this net loss. Widespread brush fires set to improve late dry season forage also impede natural regeneration. Likewise, too little of the forest areas cleared for tavy are harvested for woodfuels before burning.

Madagascar's woodfuels crisis is particularly acute for larger towns which are supplied primarily with charcoal coming from distant areas to reach markets. Although the quantitative dimensions of the rural fuelwood problem remain to be defined, there is ample evidence that fuelwood collection is a substantial burden to the peasant household, decreasing the amount of time available for more productive activities.

2.2.2 Energy use in Agriculture

The lack of power to drive agro-processing equipment is currently restricting growth in agricultural commodity conversion and processing. The response by farmers to positive changes in macro-economic policy has been dampened by the deterioration of the transport sector and the problem smaller decentralized private mills and oil presses face in obtaining fuel and spare parts.

One dominant factor affecting the revitalization of these decentralized private milling operations is the availability of relatively low cost power systems that do not rely on imported fuels.

Rice milling is a prime example. With the exception of imported rice, all rice consumed in Madagascar is processed either by hand or in "large" and "small" mills. "Large" rice mills, with capacities ranging from 8-20,000 metric tons per year are found in the major cities of Madagascar and in the Lac Alaotra areas, a large surplus rice producing region. A "small" mill is defined as a rice decorticator with a capacity of less than 8 tons of paddy per day, or less than 2,100 tons per year (assuming 260 days of operation per year).

Mechanical rice milling capacity in the rural areas of Antananarivo Province is rapidly expanding. However, growth is being suppressed by lack of equipment (motors, machinery and spares), difficulties in obtaining fuel, and a very tight rural capital/credit market.

However, there are still several issues that need to be resolved, particularly: if cheaper, more easily accessible and serviceable inputs were available to these rural investors, would this trend towards rural rice processing accelerate? And to what extent does the unavailability of local processing facilities pose a constraint on the actual production of rice and other agricultural products?

2.3 GDRM's Interest in the Energy/Natural Resource Sub-sector

GDRM's concern over natural resource deterioration has been most recently expressed in the form of the "International Conference on the Conservation of Natural Resources for Development in Madagascar". Held in Antananarivo in November 1985 under the sponsorship of the GDRM (MPARA and MPAEF) and the World Wildlife Fund, the conference brought together international and Malagasy experts to discuss natural resource issues, including their interactions, and to develop action plans to address the country's major natural resource related problems.

The conference was organized according to four major themes: (1) erosion control, soil and water conservation and tree politics; (2) continental resources including forests, pastures and protected areas/reserves; (3) coastal and inland water resources; and (4) education, training, extension and information issues.

While the formal recommendations and action plans resulting from this conference are not available at the time of writing of this report, two common concerns emerged from conference discussions:

- o The need for more quantitative information on the state of Madagascar's natural resources, including

their extent, degree of deterioration and relationships with maintaining or increasing agricultural productivity information deemed necessary by all conference participants for purposes of improved planning and decision making; and,

- o The need for a more integrated, multi-disciplinary and bottom-up approach in addressing Madagascar's conflicting land use problems.

With regard to energy inputs to agriculture (both direct and indirect), the Ministry of Industry, Energy and Mines (MIEM) is taking the lead in exploring improved agricultural processing methods and improved stoves as a means of increasing agricultural productivity and conserving the natural resource base.

Agricultural processing, primarily the milling of rice, is now being accomplished in many places by using small mills powered by diesel generators or motors. Rural inhabitants realize substantial savings by employing these small decentralized systems but the foreign exchange costs to Madagascar are high and the dependability of the systems is problematic. Spare parts are often difficult to obtain due to distribution problems and lack of foreign exchange. As rice production is the most important economic activity in Madagascar, MIEM is exploring the use of hydro-mechanical or shaft power as a cheap, reliable and locally available means of driving milling equipment, thereby improving production and providing the rural Malagasy with more value added for that production.

Hery Vao, MIEM's renewable energy resources group, is currently developing an intensive improved charcoal stoves strategy. This strategy will focus initially on a needs analysis examining the artisanal sector, marketing constraints, cooking habits and socio-economic analyses, followed by a program of design, testing and dissemination.

3.0 AID/MADAGASCAR'S CURRENT STRATEGY: AN INTEGRATED APPROACH TO AGRICULTURE DEVELOPMENT

3.1 Rationale

AID/Madagascar's current CDSS reflects the above GDRM interests and concerns; we believe that the interactions between the agricultural sector and the component sectors of forestry, energy, and natural resources need to be addressed if Madagascar is to achieve sustainable development. As Madagascar's human and livestock populations increase, greater and conflicting demands are being placed on a constant land

base. These pressures thus increasingly dictate that food, fodder, wood and other goods be produced from the same land.

In this context, the promotion of agricultural or other sectoral development against a background of natural resource degradation appears to us to be inviting failure.

3.2 Relationship to current CDSS

The 1986 Country Development Strategy Statement (CDSS); agreed to by USAID and the Government of Madagascar, emphasizes agriculture. The CDSS also stresses the need to continue to gather data and information in certain other areas and sectors that directly affect agricultural productivity. In particular, the CDSS suggested that a pre-assessment be undertaken to determine the role of energy, forestry and natural resources in sustaining agricultural production, test out a few small interventions, and identify areas suitable for further activity.

3.3 The Energy/Natural Resource (E/NR) Pre-assessment

To begin the above process, the Regional Economic Development Services Office of AID (REDSO/ESA) assembled a technical team to carry out an initial reconnaissance in July/August 1984.

The team undertook the following activities:

- o A general overall assessment of the energy/natural resource sub-sector, concentrating on the level of knowledge and information available in the sub-sector.
- o A preliminary assessment of institutional data and training capabilities in the forestry, renewable energy, and environment sectors, focussing on institutional and training constraints.
- o A review of relevant on-going GDRM projects.

3.4 E/NR Pre-assessment Summary Findings:

3.4.1 The Energy, Forestry and Natural Resource Sub-Sector

Despite the short duration of the initial visit, the team was able to identify and collect a significant amount of information on the forestry, energy and natural resource sectors in Madagascar. Field trips were necessarily limited to the plateau region around Antananarivo and unfortunately, little first-hand information or data concerning differences between agro-ecological zones was obtained.

However, a reasonably good sense of the availability of information in these sectors and across ecological zones was obtained through in-depth discussions with relevant GDRM ministries, the University and other groups in Antananarivo.

The information gathered does not contradict the assessment in the World Bank's Agriculture Sector Memorandum (June 30, 1983), which identified the serious deterioration of the country's natural resource base as being a significant factor contributing to the decline of Madagascar's agricultural productivity.

The team concluded that the interactions between agriculture, range, forestry, rural energy, environment, land tenure and other socio-economic considerations appear to be far more complex than our CDSS or the World Bank's memorandum would suggest. While strategies for improvement exist, it seems inconceivable that agricultural productivity, rural income and food self-sufficiency can be augmented without addressing the interactions between potentially conflicting uses of the natural resource base. The team also emphasized the need to begin exploring these action areas now. Increasing population pressure over much of the country circumvents the more expensive rehabilitation costs that continued large-scale environmental destruction holds for future generations.

3.4.2 E/NR Sub-sector Institutional Issues

Unlike many other developing countries, Madagascar does have a technical base from which to address the energy/natural resource sector. Furthermore, unlike most other countries, trained personnel generally have not left for more lucrative posts overseas. Although most technical people prefer the private sector as is expected, the basic infrastructure is still intact.

However, severe constraints impair the ability of this human resource potential to be fully utilized. Some problems are endemic to the country at large: lack of maintenance, transport, and operating budgets. Also, while the technical infrastructure is good, it is deteriorating and has not changed to keep up with recent advances in technical fields. Data gathering is presently at a minimum and analytical capacity is severely limited.

The capability to extend technologies is also constrained. Not only have the formal training and extension services eroded over the last decade but it is unclear whether their strengthening alone would be sufficient to promote needed increases in agricultural production. Less costly, more innovative approaches may now be needed, including

participatory extension or outreach programs (such as used in the innovative Swiss/Malagasy Agroforestry Project now underway).

The energy/natural resource sub-sector appears to be more seriously affected by budget constraints than other sectors; available extension and research funds are often directed into research and development of commercial activities. Many of those interviewed expressed concern that the productive base will not be sustained unless serious attention is paid to the efficient management of energy and natural resources.

The complete findings of the REDSO/ESA's Energy/Natural Resource Pre-assessment are found in Annex I.

3.5 E/NR Accomplishments Under the Current CDSS

The FY 1986 CDSS identified energy and natural resources as one of four priority areas requiring more data and analysis. In addition, training and technical assistance was called for in the identification and analysis of key problems and policy alternatives affecting the agricultural sector.

This CDSS also identified technical assistance and training required to improve GDRM management in the energy/natural resource sub-sector.

The Annex to the FY 86 CDSS included a chapter on the energy and natural resource sectors, and listed a series of specific recommendations, including the implementation of pilot activities through centrally-funded projects such as Energy Initiatives for Africa.

Despite the presence of only one USDH Officer at post and the initial problems inherent in opening a new AID Office, AID/Madagascar has made considerable progress in implementing a number of recommendations resulting from the E/NR assessment and current Strategy. More importantly, activities undertaken have laid the groundwork for Madagascar to take a more integrated approach to agriculture sector development. Specific accomplishments include:

3.5.1 Information

With the assistance of REDSO, ST/FENR's Forestry Support Program and USDA's Information Service, a number of literature reviews have been conducted and up-to-date documents/information have been furnished to relevant GDRM institutions on a wide variety of subjects ranging from

agroforestry and genetic improvement of multi-purpose trees to small scale charcoal briquetting technology and modular agriculture education systems.

3.5.2 Training

AID/M, using PD&S, central and project funds, has sponsored participants in a number of short term training courses directly related to development of an integrated agricultural strategy. These are:

3.5.2.1 The International Council for Research in Agroforestry's (ICRAF) Training Course in Agroforestry Research for Development

This course is intended to enhance the professional capabilities of research scientists and development planners from developing countries for initiating and implementing agroforestry research leading to the development of systems and technologies that are both suitable to local conditions and adaptable by local farmers.

Given Madagascar's increasing population, declining soil fertility, rampant soil erosion on the hillsides and rice paddy siltation, uncontrolled exploitation of forest resources coupled with a lack of cash reserves and inadequate infrastructure among Malagasy farmers, AID/M believes that agroforestry or farm forestry will be one of the keys to successful agricultural development on the island. In order for Malagasy researchers and planners to be more cognizant of land use problems and perhaps shift emphasis from commercially oriented production research issues, AID/M has sponsored three participants to this yearly course to date: one tree breeder and one silviculturalist from FOFIFA/Forestry Research and one agronomist from FOFIFA/Agriculture Research.

3.5.2.2 Regional Remote Sensing Facility Training/Nairobi

Considerable interest has been expressed by the GDRM in the use of remote sensing technology for resource assessments, inventories, etc. FTM (Institute National de Geodesie et Cartographie) has submitted a proposal to the Regional Remote Sensing Facility in Nairobi for a pilot vegetation mapping study in the Morondava Region.

This pilot project was designed by FTM in order to ascertain whether remote sensing imagery could be used to up-date the 1965 1:500,000 mapping series as regards vegetation and land use. The final production is intended to be a 1:500,000 map with routine topographic features from 1965 but an up-date of the area of vegetation types as categorized by:

humid tropical forest; dry tropical forest; thorn forest; mangrove forest; savannah and savannah woodlands; rice paddy and other agriculture.

While AID/M considered FTM's proposal an important beginning in direction of an inventory of natural resources, AID/M and REDSO/ESA considered it to be basically a mapping exercise, falling short in addressing issues such as trend analysis, forest inventory techniques, land use practices, etc. For these reasons, AID/M with assistance from REDSO/ESA suggested to GDRM that a multidisciplinary, inter-agency team be assembled for training in remote sensing technology at the Facility in Nairobi.

GDRM agreed to this approach and a five person team representing scientists and technicians from MPARA, FTM, MPAEF and the University attended a training course in remote sensing applications in agriculture and natural resource statistics and inventory techniques, at the Remote Sensing Facility in Nairobi.

3.5.2.3 S&T/FENR's Forest Administration and Management Course

AID/M, through the assistance of ST/FENR's Forestry Support Program, sponsored the participation of the then acting director of GDRM's Forest Service (now, an advisor to the Minister, MPAEF). The purpose of this course is to provide senior level LDC forestry officials with a working knowledge of new developments in public and private forest administration and management.

3.5.3 Pilot Activities

3.5.3.1 Hydropower for Agro-processing in Madagascar:

AID/M and the GDRM through MIEM are funding a small hydropower for agro-processing project in the village of Ampefy in Western Antananarivo Province. The purpose of the project is to put in place a facility for mechanically processing agricultural products using locally fabricated power equipment. The objectives of the project are to:

- o Put in place a pilot hydropower facility that will demonstrate: Madagascar's ability to fabricate essential machinery for power generation and its ability to harness local energy resources;
- o Attempt to quantify the potential for increasing rural incomes and for releasing pressures on the country's overburdened transport infrastructure.

- o Improve Malagasy capabilities to identify potential sites for small-scale hydro-mechanical generation and to determine the demand and potential for developing alternative energy sources, including the eventual exploitation of such sources for agricultural processing;
- o Establish the industrial and technological base for fabricating the machinery necessary for harnessing hydro power; and
- o Build up the country's capabilities to develop hydro sites and service and maintain hydropower installations.

3.5.4 Assessments

In addition to the Energy/Natural Resource Assessment, a number of other assessments were undertaken in order to further fill information gaps regarding agriculture productivity in the CDSS. These are:

3.5.4.1 Agro-processing

The Hydropower for Agro-processing Project was based on assumptions that opportunities for rural investment in processing facilities are currently growing at a rapid pace due to: (a) GDRM's recent liberalization of agricultural (primarily rice) pricing policies, (b) the GDRM's near total withdrawal from collecting and marketing many agricultural products (primarily rice), and (c) the severe deterioration of the nation's transport infrastructure that is retarding the movement of agricultural goods to central processing facilities.

However, these assumptions are made on a relatively limited data base and have not been subjected to rigorous analysis. Very little attention has been paid to issues concerning what happens between points of production and points of consumption, and how these interim steps affect both production and consumption.

Therefore, the Hydropower Project was designed to test these assumptions in the project area by including a series of studies on local dynamics of rural investment, the linkages between agricultural production and processing, and the structure of Madagascar's intermediate agriculture sector. The first of these studies entitled "A Preliminary Profile of Rice Processing in Madagascar" was carried out by the Energy Initiatives for Africa Project in order to provide guidance and a framework for future work on the subject. Additional studies are now being completed by Malagasy from various agencies under supervision by AID/M.

3.5.4.2 Decentralized Power to Serve Rural Needs:

AID/M, with assistance from ST/EY and the National Rural Electric Cooperative Association, (NRECA) is currently undertaking an assessment of the potential for hydro power development in Rural Madagascar. The study is intended to provide GDRM with a clear picture of the investment opportunity for decentralized hydropower for presentation to international financial institutions.

When completed, this study will provide general information on the power sector in Madagascar, including tariffs, institutional settings, and a review of hydropower studies previously conducted. NRECA's final report will present the prefeasibility-level analysis and will examine the energy demand, supply and market opportunities for decentralized hydropower with recommendations on whether to proceed with the feasibility stage. If warranted, feasibility studies of representative hydropower sites and possibly complementary projects will be performed to provide more detailed technical and overall implementation design as a basis for investment decisions by lenders. Subsequent stages include NRECA assistance to GDRM in securing financial commitment from donor agencies, and monitoring and evaluating projects to feed lessons on new experience back into the program assessment and formulation process. In particular, NRECA is assisting the World Bank to incorporate the recommendation of this study into the Bank's Energy I project.

3.5.4.3 Institutional Capabilities in Statistics

The purpose of this assessment, which was carried out by the Bureau of Census and the U.S. Department of Agriculture, was to provide AID/M with a broad understanding of the statistical capabilities of various institutions in GDRM (MPARA, MPAEF, FOFIFA, INSRE) involved in the agriculture sector. AID/M believes that clear knowledge of such statistical capabilities is essential to Mission interest in developing a program designed to assist the GDRM in strengthening its statistical operations. In turn, a solid statistical base is requisite to effective development planning. A special effort was also made to evaluate potential sites for microcomputer installations as well as specific existing applications which could be developed at these sites. The report also contained a set of recommendations as to how AID/M might consider reinforcing current resources and statistical activities of selected GDRM institutions. These recommendations have been instrumental to AID/M and other donors in developing strategy and bilateral programs and projects.

4.0 FY '87 STRATEGY UPDATE: AN INTEGRATED APPROACH TO AGRICULTURAL DEVELOPMENT AND PRIVATIZATION

4.1 Summary

It is increasingly evident to GDRM and AID/M that sustainable agriculture and hence rural development in Madagascar will depend on long term environmental stability. Soil and water conservation achievable through forestry and tree planting as well as careful evaluation of renewable energy supply and demand options will ultimately be required to halt the degradation associated with inadequate land use choices such as uncontrolled fuelwood and charcoal harvesting and shifting agriculture. AID/M intends to promote activities and concepts which demonstrate natural resource's contributions to maintaining or increasing agricultural productivity and environmental stability where appropriate.

It is expected that the power component of the energy/natural resource portfolio will be gradually integrated into a series of activities and policy analyses related to agricultural processing. AID/M plans to continue work on decentralized power systems for agricultural processing and proposes to examine the potential for locally manufactured agro-processing equipment. REDSO/AID has been examining the potential for promoting the revitalization of agricultural processing in the country, and has carried out several assessments as well as one pilot activity which tests the potential for locally constructed hydropower turbines for use in rice milling. A major assessment of agro-processing on the island is also proposed.

As the CDSS process begins to emphasize the saving of foreign exchange, the promotion of FX earning activities and an increased emphasis on private sector initiatives, previous work undertaken over the last two and a half years by AID/M in the E/NR sub-sector indicates the following opportunities:

- o Promotion of indigenous fuel sources for local industries, including the cement plants, through the carbonization of thinnings from the Fanalamanga Pine Plantations;
- o Construction of micro-hydro schemes designed to replace specific diesel plants, for use by major export-oriented agricultural processing centers;
- o Promotion of replication of locally fabricated hydro-mechanical plants for powering decentralized rice mills and oil presses;

- o Promotion of grass roots farming systems/agroforestry concepts which not only protect and conserve the natural resource base, but relieve foreign exchange demands on fertilizer imports and generate on-farm income through increased agricultural productivity.

AID/M is aware that staffing and logistical constraints will necessarily limit our response to the opportunities identified above. However, as previously stated, AID/M also believes that to promote agricultural development in Madagascar against a background of natural resource degradation, is to invite failure. Our strategy therefore is to take an integrated approach to agricultural development through the promotion of private sector energy/natural resource initiatives which have the potential for maintaining or increasing agricultural production and environmental stability.

AID/M is proposing a judicious mix of activities including networking/information exchange, workshops, short-term training and technical assistance support, assessments and local currency support to selected projects intended to maximize our effect and outputs while minimizing our inputs. It is hoped that these activities will lay the groundwork for increased donor involvement in addressing natural resource issues.

To implement this strategy, the key activities described below will draw upon AID/W and regional funds and technical staff, thus requiring minimal field support by AID/M.

4.2 Proposed activities

4.2.1 Information Exchange/Networking

AID/M, with REDSO assistance, proposes to continue to draw upon AID/W data bases for up-to-date information on research and technologies in the energy, forestry, natural resources and environmental sub-sectors, with particular emphasis on integrated systems such as agroforestry and farming systems research and development.

With REDSO assistance, GDRM will be also unofficially linked to the S&T funded ICRAF implemented "Agroforestry. Networking in Africa" Project. Although this project will only initially work in the East African highlands, much of the species and technology research to be conducted will be of direct benefit to Madagascar. AID/M will also request that FAO provide a complete set of forestry, watershed management and related documents to FOFIFA and MPAEF.

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In order for GDRM to be able to bring this information down to the level of program planning, policy change and project implementation, AID/M is also proposing to finance a study trip for senior MPARA and MPAEF officials to East and Central Africa and the Sahel. The purpose of this study trip would be to see project and program successes and failures in the forestry/natural resource sub-sector in selected countries as well as the relative success of using PVOs to implement tree planting/soil conservation projects. The objective of the trip would be to prevent these officials from making the same program and project mistakes that these countries experienced ten years ago.

If possible, recommendations from the EUCEN Assessment of the analytical capability of institutions in the E/NR sector will be incorporated to the extent possible in any follow-on project to MARS I.

4.2.2 Short Term Training

AID/M hopes to continue to take advantage of selected short term training opportunities, relevant to our integrated strategy, offered by AID Central and Regional Bureaus as well as by international agriculture research centers, particularly ICRAF, CIMMYT, IRRI and IITA. Courses of particular relevance to our strategy would be those dealing in farming systems research and development, agroforestry research and development (including multi-purpose species research, alley cropping, etc.), private forest administration, ag extension, land and tree tenure, etc.

IITA will be holding an "Alley Cropping" workshop in the near future and AID/M intends to sponsor two participants.

4.2.3 Short Term Technical Assistance/Assessments

AID/M hopes to continue the use of short-term consultancies in support of other donor activities in those instances where PVO, World Bank or GDRM programs are significantly advanced and mesh with our strategy. Particular attention will be paid to requests where substantial amounts of counterpart funds are expected to be allocated.

At the request of the World Bank, AID/M proposes to explore the possibility of channeling AID/W Technical Assistance through this office for the design of three Bank funded projects in Madagascar; Agricultural Institutions II, Forestry III, and Energy I Projects. These projects are to a degree substantively interconnected, especially in the area of sustainable agriculture, agroforestry, soil conservation, and improvement of the resource base. Such assistance would enable AID/M to maintain a certain level of leadership in the sectors

resulting from the REDSO executed E/NR Pre-assessment which was well received by both the Bank and GDRM and kindled this collaborative activity with the Bank.

This approach would also represent the least burdensome option for AID/M's continued involvement in these sectors vital to long term development in Madagascar. Given the inter-related assistance that may be required, AID/M would expect possible roles for the Energy Initiatives for Africa Project, the Forestry Support Program and various relevant activities of ST/EY.

However, any such assistance should conform to the following:

- o That it emphasize topics and activities identified in the CDSS, or in the Energy/Natural Resource Pre-assessment prepared by REDSO; and
- o That such consultants be an integral component of donor/GDRM teams, which shall be responsible for all logistical arrangements.

Given the above criteria, those activities are worthy of Technical Assistance support include:

4.2.3.1 Carbonisation of Pine Smallwood Feasibility Study:

GDRM has established and manages through its parastatal, fanalamanga, an 80,000 ha pine plantation at Haut Mangoro. Routine thinning on the plantation has been delayed and there are substantial areas of the plantation where poor growth has resulted in less than commercial timber quality stands. A program of thinning and clearfelling is now starting which will result in as much as 700,000 cubic meters per year of pine smallwood with no commercial value other than for charcoal production. At the same time the demand for firewood and charcoal in Antananarivo has led to widespread deforestation and serious soil erosion, increasing siltation in irrigation systems and waterways, and reducing soil fertility and carrying capacity in key agricultural ecosystems.

The World Bank, under its Energy I Project, is proposing a feasibility study in order to determine/demonstrate the economic viability and practicality of utilizing pinewood charcoal for household and industrial uses. If feasible, the resulting reduction in regional deforestation, and the related long term economic benefits to agriculture could be very considerable. The objectives of the study are therefore to:

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- o Design a private sector oriented program and project to carbonise, transport and market substantial volumes of pine smallwood using as a production technology an appropriate combination of low cost centralized, fixed and dispersed mobile kilns;
- o Construct, demonstrate and compare several options for private sector, small scale, dispersed carbonisation technologies which may form a part of a least cost approach to pine smallwood carbonisation in the local context.

AID/M is proposing to use a combination of PD&S, follow-on MARS, ST/EY and ST/FENR funds to provide the team leader and forest economist for this study.

4.2.3.2 Natural Resources Inventory

AID/M plans to consider the financing of a portion of the local currency costs of the World Bank's proposed Natural Resources Inventory (Ag Institutions II). Currently this inventory takes into account only soils and water points, but using local currency inputs as leverage, we will ask that vegetation and erosion potential be also taken into consideration in order to better reflect GDRM and AID/M concerns.

AID/M proposes to discuss with the World Bank ways to revise the present work plan and proposed budget, so as to reduce the role of expatriate consultants, and to expand the effort to be undertaken by the Malagasy themselves.

AID/M also proposes to call upon the services of the Regional Remote Sensing Facility in Nairobi to represent our interests in assisting the Bank in developing the Terms of Reference for the inventory and in providing guidelines and support for eventual training of GDRM personnel involved in the inventory effort.

4.2.3.3 Agro-processing/Ampefy

The Hydropower for Agro-processing Project is premised on an analysis of the agricultural system in the country in general, and Ampefy in particular. Project conceptualization and design were based on the assumptions that:

- o The change in macro-economic policies have led to a demand for decentralized mills, so that farmers can capture more of the value-added, and can lower transport costs;

- o The existing large mills cannot meet the increased demand, and their transport fleet cannot service the farmers needs;
- o Rice production and marketing in Madagascar is regionally and seasonally unequal; the availability of decentralized mills would promote increased production in the surplus regions;
- o Existing decentralized mills are often inoperable or underutilized due to the lack of spare parts, and the cost and availability of diesel fuel or electricity;
- o The lack of localized processing equipment is also constraining the production of other commodities, most notably oil crops (groundnuts, and soy) tomatoes, and maize; and
- o The unavailability of power systems is as significant a constraint to the expansion of rural mills as the unavailability of the milling equipment itself.

In order to evaluate and verify these assumptions, AID/M is proposing that an assessment be undertaken using project resources and Malagasy agricultural specialists and backstopped by REDSO. A tentative SOW for this assessment as follows is to:

- o Develop and test a viable survey questionnaire for wider application;
- o Gather detailed information on milling in Ampefy, the Antananarivo Province, and additional national information, if possible;
- o Emphasize the micro-economics and financial calculations of the millers as well as the individual farmers in the region; and
- o Establish baseline data to be used in evaluating the success of the Subproject.

4.2.3.4 National Assessment of Agro-processing and the Role of Parastatals

In conjunction with the above assessment, AID/M is proposing that a broader assessment be undertaken of agro-processing, marketing and related transport throughout the country. The assessment will evaluate the evolution of these components during the period of nationalization, evaluate the impact nationalization had on the infrastructure related to

each component, and present a portrait of the status of each at this time. A tentative SOW for this proposed assessment as follows is to:

- o Evaluate the constraints on increased production arising from the changing of policies and the reduced role of parastatals;
- o Outline and evaluate the evolution and present status of all relevant parastatals dealing with priority crops (rice, maize, groundnuts, soybeans, tomatoes, tobacco); study any substitute organizations, groups or institutions that have attempted to satisfy needs unmet by existing or previous parastatals; and
- o Evaluate the potential for improved, locally manufactured processing equipment.

4.2.3.5 Internal Assessments

In order to expand our knowledge base in the agricultural sector, AID/M proposes to use local currency and local consultants to explore several issues resulting from the Natural Resources Conference discussions, such as:

- o The potential use of local currency funds through Micro Realisation to carry out farm forestry/conservation projects in Madagascar;
- o An analysis of the educational system in Madagascar, with attention to the training and support of extension and technical staff in the forestry, natural resource and agricultural areas; and
- o Other assessment activities which might include studies on one or two of the hydro-electric sites identified under the earlier NRECA prefeasibility assessment, and/or the artisan component of the proposed multi-donor/MIEM charcoal stove program.

4.2.4 Workshops

AID/M believes that the workshop format can be a fast, effective way of presenting new ideas and concepts to GDRM personnel. As such, AID/M, with REDSO/ESA assistance proposes to sponsor the following two strategy-related workshops.

4.2.4.1 "Agroforestry Awareness" Workshop

To be conducted with ICRAF and REDSO/ESA assistance, the objective of the workshop would be to demonstrate agroforestry

as a viable land use option in the face of Madagascar's severe environmental degradation and declining agricultural productivity. The workshop would focus on mid-to-senior level technicians and project managers from MPARA, MPAEF, MRSTD and FOFIFA and regional representatives. The workshop would be undertaken in three phases. The first phase would consist of a reconnaissance visit by ICRAF consultants; the second phase would be preparation of workshop training materials by ICRAF and GDRM and the third phase would be actual workshop implementation. Workshop coordination would be undertaken by an interministerial committee. General terms of reference for the ICRAF consultancy would include (in collaboration with the Coordinating Committee):

- o Conducting site visits of all major land use systems in Madagascar, identifying potentials and problems for possible agroforestry inputs into those systems and identify research needs;
- o Meeting with MPARA, MPAEF, MRSTD, FOFIFA, University and other GDRM personnel as appropriate to ascertain and describe the level of awareness and interest in agroforestry as a land use system for Madagascar;
- o To the extent possible, describing, analyzing and documenting existing farming systems practices in Madagascar;
- o Identifying problems and opportunities for agroforestry interventions in these farming systems, including training needs;
- o Preparing a workshop implementation plan including a list of recommended participants, estimated budget (local currency costs), schedule of activities, timeframe, and training materials requirements and responsibilities; and
- o Preparing a detailed implementation plan for the second and final phases.

4.2.4.2 "Strengthening Forestry Research In Madagascar" Workshop

Research has played and continues to play a critical role in the development of energy and natural resources in Madagascar, albeit more in the traditional/commercial sector than in non-traditional areas. Both the personnel and the infrastructure are present to conduct both basic and applied research although the former is somewhat out of date while the latter has certainly seen better times but is still operational. Research problems identified during the E/NR

pre-assessment are very similar to those in other developing countries. In particular:

- o Inadequate mechanisms on the part of GDRM for formulating national research priorities and for coordinating research and development programs;
- o Conflicts between national, donor and user needs;
- o Lack of proper identification of and contact with user groups;
- o Problems created by personal interest and politically motivated research priorities; and
- o Lack of information on and difficulties in accepting realities in rural areas.

To be conducted with REDSO and ST/FENR Forestry Support Program assistance, AID/M is proposing a workshop which will address these issues while facilitating GDRM determination of a prioritized forestry/natural resource research plan for presentation to donors and for better allocation of GDRM resources.

4.2.5 Use of Local Currency

AID/M is of the belief that only people can protect the environment, and generate rural income in a self-sustaining manner, and not governments or donors. As such, AID/M believes that what is clearly needed in Madagascar is support of a series of pilot initiatives, especially those which seek to promote the use of self interest and farmer incentives in the protection and management of the resource base.

While we are not proposing any bilateral project activities of this nature in the near future, we nevertheless intend to use local currency in order to support projects that promote these concepts.

Madagascar is unique to the region in its ability to use counterpart funds efficiently and cost-effectively. This is due to two factors: highly qualified staff in segments of the GDRM, and the private sector; experienced NGOs involved with water supply projects; and a local village political structure which can harness local labor.

The potential for significant activity by NGOs, individuals, and communities in support of the energy/natural resource strategy outlined in this memorandum is clearly proven; what is now needed is an approach which provides for

the more systematic review and selection of activities for further support. In particular, it is recommended that a REDSO review group be organized to assist the AID representative in assessing whether proposed activities support the strategies outlined in this document.

While we will consider all requests from the GDRM for counterpart funds in support of World Bank activities in these sectors, we are concerned about the capabilities of some of the institutions involved in the sectors, and will prefer a project-specific or activity-specific approach rather than the provision of program funds.

Activities selected for local currency support will be selected according to the above criteria as well as the following:

- o If possible, the use of local currency should be handled and monitored by another organization (donor, NGO, GDRM agency). Except for technical inputs from REDSO, if desired, the activity should require a minimum or no management effort on the part of AID/M;
- o The local currency should complement and not supplant other funding sources, in particular locally generated resources;
- o The activity should promote and lead to a self-sustaining effort, utilizing the private sector, and if practicable local communities, as the ultimate change agent/beneficiary; and
- o Besides supporting the energy/natural resource objectives of AID/M, as outlined in this Appendix, the activity should promote other CDSS objectives, in particular support and improvement in agricultural productivity, and the saving or earning of foreign exchange.

Likely activities to be supported through local currency subventions would include:

4.2.5.1 Support to World Wildlife Fund/USA

AID/M and WWF/USA appear to have the same degree of interest in improving the data and information base concerning the status and trend of resources in Madagascar. AID/M is now in the process of preparing a memorandum which outlines areas for cooperation, including linkages to the RRSF in Nairobi.

The objective of AID/M and WWF collaboration would be to meld the conservation objectives and perspectives of WWF with the development/farm forestry interests of AID/M, while taking advantage of WWF's field presence in terms of implementation and monitoring. At the same time, AID/M would also be making a small, but important contribution to maintaining Madagascar's biological diversity. REDSO will be called upon to develop SOWs for development personnel to be included in WWF assessments.

AID/M has also asked WWF to prepare an informal note concerning an "umbrella" activity in the area of remote sensing/resource inventories which could be submitted for funding by the MRSTD or another Ministry. Should GDRM's response be favorable, we would intend to support a portion of WWF's local currency costs.

4.2.5.2 Support to GDRM/Swiss Project Centre de Formation Forestier Professionnel - Morondava and the Swiss Projet d'Appui au Reboisement Villageois-Firaisana

The Morondava Project carried out by the MPAEF and Swiss Development Cooperation Program has three objectives focussed on natural forest management. They are:

- o Research on natural forest silviculture, management and exploitation;
- o Application of lessons learned/known in a pilot/demonstration natural forest management system and rational utilization of a timber concession of 10,000 hectares; and,
- o Training of national personnel, both government and private sector in natural forest management and utilization.

The project, manned by five Swiss cooperants and a like number of Malagasy counterparts has been going for more than four years. The project was visited by AID technical forestry staff during the November 1985 International Conference on the Conservation of Natural Resources in Madagascar.

The project, in the judgement of AID staff, is progressing very well as evidenced by the following points identified during the field visit:

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- o A careful, detailed compartmentalized management/extraction plan and infrastructure has been put in place and full-scale logging is underway. These extraction efforts have been carried out under rigorous guidelines with minimum impact on remaining forest;
- o Follow-up regeneration assessments, management studies and related research as well as regeneration release and replanting have been formulated which will assure the sustained productivity of the forest;
- o A full scale sawmill has been set up in Morondava and is presently supplying local and regional timber needs. Improved sawmill conversion and residue utilization have been achieved thereby making best use of extracted wood; and
- o A continuing series of training courses and on-the-job training is underway. The research program has already produced results especially on planting practices for the most productive and demanded species.

The Morondava Project with continued Swiss assistance will over the next few years have developed a viable forest management model for the dry deciduous forests of the West Coast of Madagascar.

The Firaiana Project, under a similar arrangement with the Swiss Development Cooperation and MPAEF as for Morondava, has the objectives of:

- o Encouraging every family in each fokotany to plant 15 trees per year for three years for soil conservation purposes;
- o Making the rural population aware of the causes of deforestation by analyzing water run-off, biomass deterioration, and nutrient loss due to erosion and analyzing the importance of wood in the local economy;
- o Training the rural population/participating families in nursery establishment and maintenance, site preparation and planting techniques, and plantation maintenance and follow-up;
- o Stimulating, mobilizing and encouraging the population to apply skills acquired through the project;

- o Evaluating farmer achievements as a means of providing feedback to the extension approach and defining future project activities.

This project is also progressing extremely well and is one of the few projects in Madagascar which has a people based, bottom-up approach to development.

Because of the demonstrated commitment and effectiveness of the present Swiss/GDRM teams in these two projects, AID/M believes that local currency support to these endeavors would be a wise investment. Moreover, these projects focus on an important area of concern and local currency support would constitute a minimal management burden for AID/Madagascar. AID/M therefore proposes to initiate consultations with the Swiss/GDRM officials with a view to providing local currency support to the projects. This support would likely be focussed on increasing project efforts on sensitizing local people on the potential of the forests and exploring agroforestry techniques to slow down the pace of shifting cultivation.

4.2.5.3 Support to PVOs

AID/M believes that PVOs are one of the most effective mechanisms which can be used in supporting natural resource activities which promote agriculture rehabilitation and environmental stability. The only PVOs currently operating in Madagascar are FIKRIFAMA (a local NGO with Lutheran World Federation affiliation) and Catholic Relief Services. Both of these organizations have expressed interest in expanding their project portfolios into the natural resource/agroforestry sub-sector. Should they develop viable proposals in accordance with AID/M's CDSS, we would be prepared to finance a portion of local currency costs, subject to proposal review by REDSO and concurrence by GDRM

4.2.5.4 Support to FOFIFA/Forestry Research

AID/W proposes to support two activities identified as priority issues during the Natural Resources Conference which will lay the foundation for future AID and other donor activity in natural resource support to agricultural rehabilitation. These are:

- o Multi-purpose species trials in collaboration with the Swiss and FOFIFA;
- o Establishment of multi-purpose tree seed production and storage facilities in collaboration with the Swiss and MPAEF.

4.2.5.5 Hydro-Mechanical Power for Agro-processing

REDSO and AID/M earlier requested assistance from the Energy Initiatives for Africa Project, to assess the potential for local fabrication, installation and community operation of a hydropower facility designed to provide shaft power for rice mills and oil presses.

This pilot activity includes the local fabrication and installation of two 40 kw turbines at the village of Ampefy, as well as a series of assessments concerning the country-wide potential for the technology, and the relative importance of alternative power sources. Construction has begun on the pilot site, and the facility should be inaugurated by June, 1986.

If the pilot activity proves to be successful, AID/M expects there to be a series of requests from communities and private companies for similar sites, and assistance in procuring turbines. The development of a private sector financing facility would provide an ideal mechanism for funneling the funds necessary for this activity to the private sector; funds needed by communities and NGOs for such installations could be provided through the existing Micro-Realization and Micro-Hydraulique offices within the Office of the President and National Rural Development Bank (BTM), respectively.

In conjunction with any MARS follow-on activity undertaken on agro-processing, it may be necessary to provide a nominal amount of short-term technical assistance to support additional sites.

The Ampefy project is also a significant test of the leverage available through the use of local currency. \$150,000 from the EIA project was supported by the use of the local currency equivalent of \$900,000. These counterpart funds were allocated by the GDRM within four days of the formal request, and have so far been used judiciously and closely follow the implementation plan in the Project Paper.

The Ampefy project also demonstrates the type of activity that is possible with little expatriate technical assistance input. Carefully designed short term assistance can usefully support the competent Malagasy staff in the respective ministries, and in the private sector, a situation not found in other countries within the E/SA region.

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4.2.5.6 Other Local Currency Activities

AID/M is also considering local currency support to a number of other activities. Depending on further information, field visits and analyses, AID/M proposes to support:

- o Use of thinnings from Fanalamanga Scheme by the private sector for charcoal, for household and/or industry consumption (under the World Bank Energy I Project);
- o Partial financing of local currency component of at least one of the NRECA-designed micro-hydropower schemes (also under Energy I); and
- o Partial funding of dissemination/marketing of improved locally made stoves (based on EIA/KENGO design, and also in cooperation with Energy I);
- o Support, through a private sector funding mechanism, and through Micro-Realisation and Micro-Hydraulique, of replication of hydro-mechanical systems, if necessary.