MEXICO RENEWABLE ENERGY IN AGRICULTURE PROJECT

WORLD BANK – CASE STUDY
(1999 – 2006)

1. OVERVIEW

This World Bank/GEF project (GEF US$ 8.9 million financed under OP6, Beneficiaries US$ 6.895 million, Government US$ 1.800 million) was designed to identify and promote cost-effective applications of renewable energy in the agricultural sector.

Specifically, the project's development objectives were to:

- Provide un-electrified farmers with reliable electricity supply for productive purposes in a least-cost and sustainable manner using renewable energy technologies;
- Increase the productivity and income of the estimated 600 000 unelectrified livestock farmers in Mexico by supporting the adoption of productive investments and improved farming practices; and
- Improve the Executing Agency, FIRCO's, ability to catalyze the penetration of renewable energy technologies in the agriculture sector.

The project became effective on 21st December 1999 and is scheduled to finish on March 31st 2006. It was the first GEF project to target renewable energy in the agriculture sector and has been considered successful, so much so that a follow-up project is currently being discussed with the borrower, NAFIN (National Financing Institute) and implementing agency FIRCO (Trust Fund for Shared Risk) within the Ministry of Agriculture.

The project had the following eight components that were designed to work together to promote increased economic efficiency among farmers, chiefly by removing the market barriers for renewable energy in the agricultural sector of high start-up costs, lack of high-level technical expertise and lack of awareness among farmers.

PROMOTION (US$ 1.824 MILLION)

The Promotion component of the project was designed to increase the awareness among Mexican farmers, private sector companies and government agencies of the potential benefits of renewable energy technologies.

Promotional activities financed to achieve this have included carrying out national and regional producer workshops, demonstration events, and participation in fairs and exhibitions.

INSTITUTIONAL STRENGTHENING (US$ 1.590 MILLION)

The institutional strengthening component was designed to both increase the capacity of private and public sector technicians to work with farmers to design, install and maintain farm-based renewable energy systems and build the capacity of renewable energy vendors. In particular, this component has been developing and partially funding a *Distance Learning Diploma in Photovoltaic Systems* for rural development run by the Universidad Nacional Autónoma de México (UNAM).

SPECIFICATIONS AND CERTIFICATION (US$ 0.275 MILLION)

In order to ensure high quality renewable energy equipment and support services and thus improve farmers' confidence in renewable energy systems, the project is introducing a certification scheme for providers that will be mandatory for contractors working on government supported activities.

MARKET DEVELOPMENT (US$ 0.687 MILLION)

In order to develop optimal technologies to promote throughout Mexico, the project has carried out pilot projects to test systems for:

- Solar water heating for sterilization of fruits and vegetables;
- Biogas generation and use for process heat and power in slaughter houses;
- Solar / wind driven refrigeration systems for cooling milk;
- Solar / wind driven freezing systems; and
- Photovoltaic systems for pumping water for livestock and crops.

Some of the most important lessons learned from this project regard how to develop successful pilot projects and these are discussed further below.

In addition to these, the project has been supporting a two-phase market development study which is looking in greater depth at the need for renewable energy and how this can be supplied. The results of this are being used and disseminated through the project's Promotion and Demonstration components.

DEMONSTRATION (US$ 18.770 MILLION)

The project's demonstration component follows up on the pilot projects conducted under the Market Development component to provide direct financial investment to support the installation of up to 1,150 solar-powered water pumping systems, 55 wind-powered water pumping systems, and 24 solar-powered refrigerated milk storage tanks throughout Mexico.

TECHNICAL ASSISTANCE (US$ 4.919 MILLION)

The project's technical assistance component was designed to ensure the quality and appropriate operation of renewable energy systems acquired through the project and to disseminate information about successful operation. Training courses have also been planned and undertaken for thousands of engineers, technicians, decision-makers, and other beneficiaries.

VENDOR FINANCING (US$ 2.261 MILLION)

Starting with a pilot program in Baja California, this component is implementing a vendor-financing facility to enable farmers to invest in renewable energy. It is currently supporting 26 projects and being expanded to cover the whole of Mexico. The nationwide financing facility will be capitalized initially by US$ 360 000 investment (US$120,000 by the GEF, US$120 000 by the government of Mexico, US$120 000 by equipment providers) and will use this capital to leverage initial investments by the Banco del Bajio of up to a total of $1 800 000 (5 times the capital).

PROJECT MANAGEMENT (US$ 0.965 MILLION)

The project is being executed using a Project Coordination Unit in FIRCO's Mexico City headquarters and a network of staff in each of its state offices.

2. CORE ISSUES AND LESSONS LEARNED

From a project development perspective, the most important lessons learned are in considering the livelihood changes that the project will produce and implementation and to promote an integral approach to all components. This section explains the most important lessons learned in this specific project regarding these issues. For information on the scientific aspects of renewable energy technology, see the Spanish document of "successful projects" produced by the project.

TAKING INTO ACCOUNT FUTURE LIVELIHOOD CHANGES

When deciding on the renewable energy systems that would be best to promote, it is important to plan not only to provide new energy sources or to replace current energy sources with more efficient renewable energy sources (e.g. p.v. water pumps replacing diesel pumps or use of a natural water source), but also to *take into account the livelihood changes that this increased efficiency will make to farmers.*

For instance in many cases, using p.v. pumps to provide water for cattle ranching provided increased water resources at a lower opportunity cost. Many farmers then chose to install tanks to store the water which was then used to diversify their economic activities such as beginning cultivation, particularly of vegetables. If a project's goals are to be achieved optimally, it is therefore essential that the subsequent livelihood changes of new energy sources be considered and planned for.

> *Lesson learned:*
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> *In the process of achieving the project's objectives, it is essential to consider the livelihood consequences that will occur through provision of renewable energy and to integrate this into all components.*

DISSEMINATION

Sustainability and replication are key for this type of project and diffusing and introducing the technology to users and suppliers was an integral part of project design.

Three of the project's components (Promotion, Demonstration and Technical Assistance) are directly aimed at dissemination and dissemination has also been an integral part of all other project activities including development of pilot projects, studies, certification schemes and courses. Successful dissemination involved ensuring that these components have worked together in a complementary fashion. The Promotion and Demonstration Components have carried out national and regional producer workshops, demonstration events, and participation in fairs and exhibitions. Technical Assistance has also been very important for disseminating technical information to users and providers and it is discussed separately below.

> *Lessons learned:*
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> *Ensure that dissemination is given prominence in design, is integrated in all components and project activities and that dissemination activities increase towards the end of the project.*

TECHNICAL ASSISTANCE

Technical assistance was focused not simply on teaching farmers how to use RET but on explaining and demonstrating how their productive farming activities could be improved through the greater efficiency and lower risk provided by this energy source.

In order to maximize the effectiveness of the knowledge gained, in its closing stages the project is further stepping up its technical assistance work including training courses for thousands of engineers, technicians, decision-makers, and other beneficiaries. In order that these courses can continue after the end of the project, and also to increase the perceived worth and therefore attention of participants, 35% of the costs of each course are covered by a fee charged to participants. This was made possible by FIRCO's recent contracting of the private agency ANES (Mexico's National Association of Solar Energy – *Asosiación Nacional de Energía Solar)* to conduct the courses. This allows both that a fee can be charged for the course (as a government agency FIRCO could not charge directly for its services) and also that the courses can continue to be financed and run after the end of the project.

ANES has also been closely involved in the other dissemination activities and has been following relevant activities in other components such as development of pilot projects.

> *Lessons learned:*
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> *(i) Technical Assistance must focus on demonstrating the outcomes and benefits of using RET, not simply on showing how to use it.*

(ii) A wholesale approach to technical assistance, possibly achieved through contracting an agency to do the work, can increase efficiency and also may improve outreach to further potential users.

(iii) Integration of components is essential in order that technical assistants can use the knowledge gained through other project activities.

IMPLEMENTATION OF SUBPROJECTS

All procurement of goods and small works financed by the project were carried out in accordance with the Bank's *Guidelines for Procurement,* and all consultants were selected in accordance with the Bank's *Guidelines for the Use of Consultants.* However, in many cases, simplified procurement procedures, including the utilization of local shopping and direct contracting, were utilized by beneficiaries using their own financial contributions (pilot project beneficiaries always financed at least 50% of all pilot projects themselves in order to ensure the pilot projects really had the support of farmers). The implementation of these procedures required strong supervision on the part of FIRCO and its state offices. However, as sole or joint implementing agency of other Bank supported projects, FIRCO had developed sufficient capacity to meet the Bank's minimum procurement management requirements and this was found to be more efficient than using formal bidding processes due to the remote and scattered location of the beneficiaries which means there is little competition among contractors.

Lessons learned:

Ensure subprojects have direct investment from beneficiaries and if appropriate use this to increase efficiency of procurement.

CHOICE OF IMPLEMENTING AGENCY

One of the most important strategic choices is in which ministry to implement such a project, for instance, planning, energy, health, agriculture or environment.

This project was implemented by Mexico's Trust Fund for Shared Risk (FIRCO – Fideicomiso de Riesgo Compartido), an agricultural extension service under the Mexican Secretariat of Agriculture (Secretaría de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación - SAGARPA). FIRCO was able to implement the project in synergy with the federal government's *Alianza para el Campo* Program which enabled the project to build on *Alianza's* well-established matching grant program, which was already helping to support the purchase of renewable energy systems by farmers, and supporting the successful operation of renewable energy technologies

Working with the agriculture ministry enabled the project to understand the needs of the beneficiaries and to take advantage of the opportunities for creating synergies with other activities affecting farmers and this was considered essential for ensuring successful application of the technology.

Lesson learned:

The implementing agency selected has to be related to the sector that will benefit from the renewable energy. For this project, it was the agriculture sector. In others it might be health or urban planning.

REPLICATION

Replication is an essential part of this project's success. The project found that keeping track of replication systems installed and also implementing a vendor financing mechanism to enable farmers to get credit to buy renewable energy systems were necessary but difficult activities. In its closing stages, the project is continuing with these and further information will be available will be available after the end of the project.

Lessons learned:

Ensure the project is designed to keep track of replication systems installed and take great care if trying to implement a vendor financing mechanism.