MID-TERM EVALUATION

of

APPROPRIATE TECHNOLOGY INTERNATIONAL:

LATIN AMERICA/CARIBBEAN REGION REPORT

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by

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Latin American Region Evaluation Team
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EXECUTIVE SUMMARY

A. Introduction

During November and December 1985, the Office of Evaluation (PPC/CDIE) and the Science and Technology Bureau (S&T/RD) of AID jointly sponsored an independent mid-term evaluation of the activities of Appropriate Technology International (ATI) under its Cooperative Agreement with AID since October 1983. This report, which presents the findings and conclusions of the Latin America/Caribbean (LAC) component of the Evaluation Team, is one of three regional reports. Similar regional reports cover the ATI program in Asia and Africa.

During a three-week period in November 1985, a three-member team visited ATI projects in Costa Rica, Honduras, Guatemala and the Dominican Republic and evaluated three of the six Cooperative Agreement projects in the Region. These three projects ("Lime Kilns Technology," "Assistance to Small-Scale Swine Producers," and "LAC Regional Wheelchairs Production") represented different priority technical fields and showed differences in stage of implementation, types of implementating organizations, and level of project complexity. ATI's LAC region conducted commercial analyses to support project plans. However, in the three projects reviewed, insufficient attention was paid to marketing issues. ATI's LAC staff and the implementating organizations faced problems as they occured during implementation and worked to resolve them in ways that reflected cultural preferences and sensitivity.

B. ATI's Cooperative Agreement

Appropriate Technology International's current three-year Cooperative Agreement with AID was signed September 30, 1983. Its purpose was to strengthen ATI's capacity to facilitate the choice, development, transfer, adaptation, commercialization, assessment and replication of technologies appropriate to the poor in developing countries. In particular, it sought to redirect ATI's earlier program under the AID/ATI grant. The Cooperative Agreement called for ATI to carry out innovative activities which, although inherently risky, with proper management could have a high payoff potential. Specifically, ATI was to:

- Concentrate on a limited number of priority technical fields: agricultural product processing and utilization of agricultural wastes, local mineral resources, and equipment and support for small farms;

- Determine the economic and commercial sustainability of activities it planned to promote;

- o Achieve a balance between technical and institutional aspects of appropriate technology promotion;

- o Focus on small-scale enterprises and organizations providing services or support to these;

- o Emphasize field activities;

- o Emphasize activities based on "hard" technologies; and

- o Play a catalytic role in activities it supports, getting as much leverage as possible from its investments.

C. Purpose of Evaluation

The purpose of this evaluation was to:

- o Evaluate ATI's performance under the Cooperative Agreement through October 1985;

- o Determine lessons of broader significance to be learned from ATI's program about the technology transfer process and the promotion of small- and medium-scale industry; and

- o Analyze ATI's planning for and capability to carry out an increased program focus on replicating innovative elements of its successful projects.

The overall seven-person Evaluation Team met together for pre- and post-field work discussions but split into three groups to visit projects in each of three regions--Africa, Asia, and Latin America.

D. Findings, Conclusions, and Recommendations

This regional report describes in detail:

- o The roles of the implementing organizations (IOs) and other intermediary organizations for the ATI projects visited in the region;

- o The productive activities promoted under each project visited; and

- o ATI's linkages and information flows in the projects.

The Evaluation Team assessed the capabilities and commitment of the IOs and reviewed briefly the history of ATI involvement in the country. The report also treats:

- o Sources of project ideas;

- o The purposes of each project;

- The progress under the project plan;
- The likely commercial viability of the productive enterprise;
- The risks involved in the productive activity and ATI's assessment and handling of these risks; and
- The outputs/impacts of the projects.

The Evaluation Team examined the likely marketability of the project products, as well as the marketability (replicability) of the core technology used to produce them. All these assessments were limited by the early (or not yet operational) stage of the productive activities in each project and by the stage of development of the core technologies.

The general conclusions for the LA/C region program, based on the field visits and later discussions among the full Evaluation Team, were drafted and critically commented on by both ATI and the S&T Bureau. These general findings and conclusions have been incorporated into the main report of the evaluation and its appendices (see especially Appendix F and Appendix G)[1]. Recommendations for the regional program and for ATI overall management have been fully considered in the overall evaluation recommendations of the main report. Consequently, this regional evaluation report is limited to detailed findings, analyses and conclusions by country, implementing organization, and project or subprojects. The main report of the ATI mid-term evaluation contains the regional and overall field program findings and conclusions.

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[1]Peter Delp, et al, Promoting Appropriate Technological Change in Small-Scale Enterprises--Evaluation of A.T. International's Role, AID Evaluation Special Study No. 45 (Washington, DC: Center for Development Information and Evaluation, U.S. Agency for International Development, 1986).

I. INTRODUCTION

A. ATI's Involvement in Latin America/Caribbean

ATI has historically had a diverse and geographically dispersed project portfolio in Latin America. Prior to the AID/ATI Cooperative Agreement, staff members had developed 91 projects in the region, concentrated in Central America (four nations), the Caribbean (seven nations) and Colombia. (See Table 1.)

The Latin American/Caribbean (LA/C) portfolio as of November 1985 has six projects which have been approved since the AID/ATI Cooperative Agreement was signed. Four projects are currently being developed in three Central American and Caribbean countries (the Dominican Republic, Costa Rica and Haiti) and one South American country (Peru). Two of these projects are also being supported by ATI as part of an overall strategy to foster replication. Production of the Hotchkiss Wheelchair is being promoted in the Dominican Republic, Guatemala, Honduras, Colombia, Peru and Brazil, and the Linares Pump is being developed on a pilot basis in Dominican Republic, Mexico, Guatemala and Colombia. The average size of new LA/C projects is US$ 148,722, somewhat smaller than the overall average size of Cooperative Agreement projects for ATI, which is US$ 155,778.[1]

B. ATI's Strategy and Staff

ATI's strategy in the region has been to develop projects of high utility to targeted constituents, to reach out where AID has not been actively developing projects, and to maximize the benefits from the know-how, language skills and contacts of project officers with extensive field experience in specific nations. The ATI Regional Manager, who has been with ATI since before the AID/ATI Cooperative Agreement was signed, indicated that selected appropriate technology opportunities exist in Latin America. However, it is difficult to find organizations willing to carry out commercially viable applications of appropriate technology in the LAC region because of competition from highly subsidized donor-funded projects. ATI's yearly budget could be easily absorbed by this region alone, according to his perceptions.

As of November 1985, one project officer and the regional manager are the only staff to develop project concepts and manage field operations in the region. The regional manager is also assisted by an administrative officer assigned to the LAC program. Back-up support

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[1]Based on data from ATI files provided to the ATI Evaluation Team entitled "ATI Cooperative Agreement Projects with Productive Activities", which lists 27 projects from Asia, Africa and Latin America combined. The average for the LA/C region does not include the Linares Pump, which was significantly smaller than the other grants and therefore would have skewed the average.

Table 1: Countries of ATI Operations in Latin America/ Caribbean Region, Past and Present

PRE-COOPERATIVE AGREEMENT 9/78 to 9/83	SINCE COOPERATIVE AGREEMENT 10/83 to Present
Antigua	Costa Rica
Barbados	Dominican Republic
Bolivia	Guatemala[1]
Brazil	Haiti
Colombia	Honduras[1]
Dominica	Mexico
Dominican Republic	Peru
Grenada	
Guatemala	
Haiti	
Jamaica	
Mexico	
Nicaragua	

[1]ATI has limited operations in these countries.

Source: ATI files.

for project design and monitoring has been provided by ATI's Evaluation and Technology Development Group (ETDG).

C. Evaluation Methodology

The overall seven-person ATI mid-term Evaluation Team met together in Washington, DC for pre- and post-field work discussions. It split into three groups to visit projects in the Africa, Asia, Latin America/Caribbean (LA/C) regions. During a three-week period, November 4-22, 1985, the three-member LA/C team visited three ATI Cooperative Agreement projects (see Annex 2) in Costa Rica, Honduras, Guatemala and the Dominican Republic. The Evaluation Team also visited Oakland, California to discuss the regional wheelchair project with the designer, Mr. Hotchkiss, and to observe a training session.

The ATI LA/C Regional Manager accompanied the Evaluation Team throughout the field trip, and the ATI Minerals Resource Specialist joined the team for the Costa Rica portion of the field evaluation. The Evaluation Team did not visit Peru and Colombia, which have a large number of participating enterprises, because of constraints in the overall evaluation design.[2]

The LA/C team derived its findings, conclusions and recommendations presented in this report from:

- Review of project-related documents and studies on ATI's projects in the LA/C Region (Lime Kilns, Swine Feed and Regional Wheelchairs).

- Interviews with ATI staff, implementing organization staff, and knowledgeable persons in each of the countries visited. The latter included staff of USAID and representatives of local non-governmental organizations (NGOs); and

- Field observations of specific activities already underway, including conversations with intended project beneficiaries and local project field staff.

During the pre-field work meetings in Washington, the Evaluation Team developed a framework for the evaluation and agreed upon a set of basic issues which would guide the field inquiries. Wherever possible during the field work, the team gathered hard data on the technologies and the implementing organizations. The overall team met again in Washington in December and met with ATI headquarters and field staff, prior to completion of the regional reports.

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[2]None of the 10 projects with baseline data designated for mid-term evaluation by both AID and ATI were located in Peru or Colombia. Wheelchair promotion sites in Central America were visited because the team was in the area.

The regional reports serve as working papers for the main report of the ATI mid-term evaluation, which goes beyond the field operations to examine broader issues.

II. FIELD OPERATIONS IN THE DOMINICAN REPUBLIC

A. ATI's Planning and Field Operations in the Dominican Republic

1. History

The Dominican Republic is richly endowed with fertile lands, water resources, adequate infrastructure (roads, electricity, etc.), and high literacy and per capita income rates in comparison to other Caribbean nations. Its geographic propinquity to the US and the long history of cultural and economic exchange with its northern neighbor have had significant impact on the extent and pace of the Dominican Republic's economic development.

ATI has developed a number of projects in the Dominican Republic throughout its operating history. Of the ten projects undertaken before the AID/ATI Cooperative Agreement, two have achieved notable success: the US$ 90,600 criollo cattle breeding and pasture management project (which enabled small-scale farmers to improve milk yields from their domesticated cattle), and the US$ 55,000 seed capital grant to the Programa de Assistencia a la Pequeña Empresa (PROAPE), a micro-enterprise lending program. The ATI LA/C Regional Manager has eight years of experience working in the Dominican Republic--from 1964 to 1967 as a member of the Peace Corps staff and for the last five years as the field officer responsible for developing and monitoring ATI's projects.

2. Projects under the Cooperative Agreement

Under the AID/ATI Cooperative Agreement, ATI has developed two projects (the Swine Feed Project and a Hotchkiss Wheelchair production unit) and sponsored one conference (concerning fiber cement roofing sheet manufacture) in the Dominican Republic. The projects cover the agricultural processing and the truly unusual opportunities areas of ATI's technology focus. The Evaluation Team conducted a field visit to the Swine Feed Project and presents its findings and conclusions in the report below, which begins with a description of the implementing organizations and the project and concludes with summary findings. Table 2 summarizes the Swine Feed Project. Findings on the wheelchair promotion are presented in Chapter IV.

B. Description and Findings of Implementing Organizations and Projects in the Dominican Republic

1. CIMPA and CENIP: Description and findings

a. History and funding

The Center for Improvement of Animal Production (CIMPA), a subsidiary of a nonprofit, private regional development organization called Association Para El Desarrollo, Inc. (APEDI), has been

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Table 2: Swine Feed Technology Summary Description

Region: Latin America/Caribbean	Project No.: 84-20
Country:	Dominican Republic
Name of Project:	Swine Feed
Location of Project:	Santiago area, Dominican Republic
Implementing Organization IO:	Center for Improvement of Animal Production (CIMPA)
Productive Activity:	Various vendors of swine feed inputs--already underway
Starting Date of Project:	May 18, 1984
Number of Months Elapsed at Time of Evaluation:	17 months
Scheduled End of Project Date:	November 30, 1986
Total Funding:	$160,977
Purpose of Project:	To establish a commercial system to improve the availability of specific feed ingredients and related inputs to small scale swine producers.
Description of Technology:	The project will produce and sell balanced feed and high protein feed produced from domestic inputs like molasses and ramie. Sales of these feeds will be through provincial development associations, farmers groups or cooperatives.
Disbursed thru October 31, 1985:	$64,087

developing agricultural and agro-industry projects in the Dominican Republic's Cibao region since 1975. CIMPA employs 36 people (including 14 technicians) and maintains a large farm where it carries out eight major research programs (developing a gene pool for swine reproduction, a native breed of cattle and a native breed of mule, native fish stock etc.) and five related sub-programs. The farm also serves as a "classroom" where technical assistance and training are rendered to develop and test a commercially viable technology delivery system. The purpose is to help small farmers who produce hogs to increase their incomes by making more effective use of local agricultural produce and wastes in coordination with specific manufactured feed ingredients.

CIMPA is the Project Holder and Manager of the ATI Swine Feed Project, and has provided the services of the Project Director and full-time Field Coordinator[1] as well as extended use of its Swine Reproduction Center and Training Institute. CIMPA obtains operating funds from private and public domestic sources and international development organizations.

The National Center for Livestock Research (CENIP) has backstopped CIMPA's efforts, providing the part-time services of a Technical Advisor to the project (two days per week), the use of its experimental farm and technical literature search services. CENIP maintains three experimental livestock stations in the Dominican Republic, employs 30 technicians and has four ongoing programs with goats, pigs, cattle and domesticated fowl. CENIP receives its US$ 30,000 yearly operating budget from the government.

b. Purpose of ATI's project with CIMPA and the technology

The ATI Swine Feed Technology Project meets a need to increase the year-round availability of edible plant fodder and improve the diets of pigs in the Dominican Republic by providing more protein, carbohydrates, vitamins and minerals cheaply. (See Table 3.) This is achieved by stimulating the production of ramie (a green chop plant that can be harvested throughout the year) and by encouraging farmers to supplement traditional swine feed inputs (various edible foliage, palm nuts and table scraps) with manufactured feed ingredients (a 40 percent protein supplement, a pig weaning feed called iniciador and molasses). A measured combination of these ingredients will produce a low-cost, nutritious and balanced diet that lowers absolute feed costs and increases feed conversion efficiency[2] for end-users.

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[1]The ATI grant to CIMPA provides full funding for the field coordinator, one-eight time funding for the project director, and ten days per month for the part-time technical advisor.

[2]Defined as the ratio of pork produced to feed consumed.

Table 3: Dominican Republic Swine Feeds Cost Efficiency of Selected Feed Technologies

Ration	Cost Per 100 lbs. Ration	Pounds of Ration Consumed Per 100 lbs. Gained	Cost Per 100 lbs. Gained
Imported Commercial Feed	RD 12.00/100	320/100	RD 38.40
ATI Intermediate Feed Technology	RD 8.20/100	350/100	RD 29.50
Traditional Feed Technology	RD 6.85/100	500/100	RD 34.25

Source: ATI "Project Plan," Assistance to Small-Scale Swine Producers, Annex B.

The project was designed to establish a commercially-viable delivery system for feed inputs to small-scale rural swine producers. The program, scheduled to be carried out over a 30-month time period, is budgeted at US$ 160,977 and is targeted to some 2,000 farmers residing in six northern provinces of the Dominican Republic who are engaged in marginal production of pigs for domestic market consumption. CENIP has already completed three generations of tests in which it was demonstrated that the new rations produced the results predicted in the project plan.

c. Project Implementation Plan

The Swine Feed Project was developed by the ATI LA/C Project Manager, the Project Technical Advisor and a previous director of CIMPA. The calamitous outbreak of African Swine Flu in the Dominican Republic during the late 1970s necessitated the wholesale slaughter of all pigs. A nation-wide pig repopulation program began in 1982 with breeding stock imported from the US, which was initially provided to large swine producers on the condition that they utilized imported feed stocks to ensure proper nutrition. As the swine population increased, pigs were provided to small producers through various swine repopulation programs, but subsequent peso devaluations raised the real cost of imported feed inputs beyond the reach of most of the rural, subsistence agriculture producers.[3]

In an effort to resolve this problem, project designers decided to develop an intermediate feed technology that struck a balance between high technology feeds (100 percent imported inputs) and traditional technology feeds (table scraps, agricultural produce market rejects, rice bran, palm nuts, and green foliage), enabling the small producer to improve his/her competitive position relative to large-scale, capital intensive producers. The new feed was composed of chopped green foliage (60 percent on a dry weight basis) mixed with protein supplement (15 percent on a dry weight basis) and bonded by molasses (25 percent on a dry weight basis). This combination proved cheaper than even traditional feed technology, whose comparatively inefficient conversion ratio required more feed inputs to produce one pound of pork flesh (see Table 3).

The project called for a two-tier implementing organization effort at the outset (see Figure 1); CIMPA was to provide overall project supervision, coordinate the assistance provided by CENIP and extension agents provided by the Ministry of Agriculture, seek out the private Provincial Development Associations (PDAs) who would link CIMPA to feed supplement vendors, and manage credit lines to project participants. At the outset ATI thought that the key element of the project were the second-tier PDAs, regional private voluntary groups with strong, direct linkages to the private vendors forming the backbone of the delivery

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[3]Soybean meal, a key ingredient in most protein supplements, was still affordable in November 1985 according to ATI.

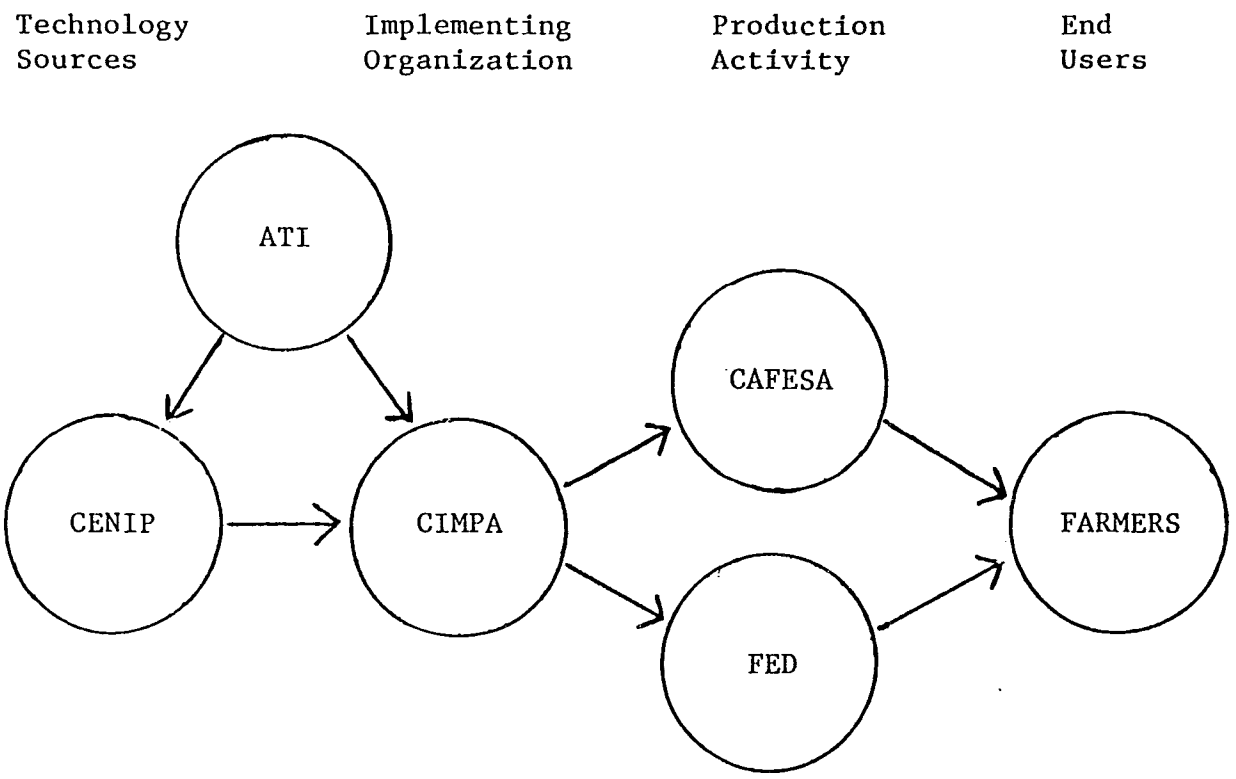

Figure 1: Swine Feed Project

system to the small-scale swine producers. The PDAs were to act as distribution depots for feed inputs provided to the vendors, financial intermediaries for loan funds from CIMPA to the vendors and to the small-scale producers, and as technical assistance brokers for the extension agents and vendors. However, in the course of the implementation of the original project design it was found that cooperative stores would be better suited for this important role.

Project success depends now on the ability of CIMPA to create a productive network of stores selling intermediate feed technology inputs to a sufficiently large number of small farmers who can only purchase small quantities of inputs at a time. The productivity of the stores will be dependent on adequate extension training and technical assistance to promote the feed technology among small-scale producers and to enable vendors and implementing organizations to make rational decisions regarding financial transactions arising from project execution. Ancillary project activities, which strengthen and deepen its scope, include: ongoing research and development to devise new feed combinations using various substitute ingredients, the establishment of ramie plots to provide rhizomes for propagation, establishing quality standards for locally-manufactured protein supplements, initiating demonstration feeding trials to measure and compare the effect of the intermediate technology feeds to both high and traditional technology feeds (vis-a-vis weight gain and growth to maturity time span), and providing small-scale farmers with medicines and appropriate hog-raising equipment (such as farrowing crates, feed troughs and waterers).

d. ATI funding, counterpart contribution

ATI allocated a US$ 161,000 grant to the Dominican Republic Swine Feed Project, of which US$ 24,834 was budgeted to cover salary expenses of the Project Director (working one eighth part-time), the Technical Advisor (part-time), the Field Coordinator (working two-fifths part-time) and extension agents. Revolving credit funds totaled 62 percent of the project grant (US$ 100,000). A budget breakdown is detailed in Table 4. No counterpart contribution was provided for this project.

The revolving credit fund provided three separate credit tranches to project participants through CIMPA: short-term working capital loans to the PDAs for individual farmers (45-day average maturity), short-term working capital loans to the vendors (90- to 180-day average maturity) and longer-term loans for the acquisition of molasses handling and storage equipment by either PDAs or vendors. Interest was to be charged on loans extended by the PDAs to vendors and to individual farmers, but the PDAs were not charged by CIMPA a corresponding interest fee. The short-term loans to farmers were initially to be executed through a purchase voucher system which ensured that funds would not be diverted to other uses, that transactions would be expedited quickly, and that vendors would receive immediate payment. Implementation of this revolving credit system was

Table 4: Dominican Republic Swine Feeds
(Project Budget in US$)
(RD 1.8/$1)

Item	Amount
Personnel	$ 24,833.33
Vehicles	12,144.44
Contracted Services	15,111.11
Credit Funds	100,000.00
Administrative Costs	5,555.55
Other Expenses	3,333.33
TOTAL	$160,977.76

Source: ATI Project Plan "Assistance to Small-Scale Swine Producers" p.24.

cancelled because it was found that there was sufficient institutional credit in the Dominican Republic.

e. Operating procedures of CIMPA

CIMPA has effected its reporting and administrative procedures as stipulated in the grant agreement. Quarterly reports have sometimes lagged behind schedule. The content of quarterly reports have improved over the course of project implementation. While the project design has changed several times, the grant agreement was amended once to provide for the purchase of a motor vehicle with US dollars. A second and more comprehensive project amendment was in the last stages of development.

2. Secondary implementing organizations, CAFESA and FED: description and findings

a. Business objective

The project plan identified PDAs as the operative technology intermediaries which, functionally, would promote linkages between local private vendors and base farmer groups (rural neighborhood groups organized for specific purposes). In fact, these private PDAs have not responded to the swine feed project as enthusiastically as was initially contemplated; the Moca group has now withdrawn from the project at CIMPA's request and is turning over two molasses storage tanks to two local farmer's associations that will participate in the project. As stated earlier, the distribution function that was to be performed by the PDAs, is now being performed by two bulk purchasing cooperatives, with a total membership of over 5,000 and which include a high percentage of small swine producers. These cooperatives are, Asociación de Campesinos Federados de Salcedo (CAFESA) and the Federación Campesina Zambranachacuey, Inc. (FED). Both sell wholesale products to affiliated as well as non-affiliated rural retail stores.

The CAFESA cooperative was initiated by an Augustinian monk, Padre Felix Azcarate, in 1978; it represents 130 base farmer groups in eight zones of the Salcedo region and operates five retail stores selling light consumer goods (food, candles, gasoline, etc.) that reach approximately 1,500 people. The new feed inputs have been selling at five of the CAFESA stores for approximately eight months. CAFESA also has established a sewing workshop, production of local crafts for tourists, distribution of piglets and production of honey.

The FED is a cooperative representing approximately 2,400 campesinos (of whom approximately 450 have pigs) and has been participating with the program for a few months. The FED has responded quickly to the Swine Feed Project; a loan to finance the purchase of a molasses tank has been contracted from CIMPA and sales of feed inputs have quite recently begun at three rural stores (which are informally working with the FED).

b. Description of overall system

CAFESA and the FED supply the retail outlets with intermediate feed inputs purchased with credit provided by CIMPA and then sold in small lots to producers living within an eight kilometer radius of each retail outlet. Both CAFESA and the FED receive quotas from the government for bulk purchases of molasses. Currently CAFESA is the only intermediary that mixes the 40 percent protein supplement. The project's Technical Advisor and Field Coordinator both offer short extension courses at the stores at periodic intervals to promote the program and explain the intermediate technology. Farmers incorporate the new feed technology into the diet of their pigs, which are regarded as secondary sources of income; pigs are a form of insurance against adversity, since they can be quickly converted to cash if death or illness in the family occurs.

c. Progress to plan

The Swine Feed Project is more than 15 months into its 30-month implementation period; US$ 64,087 has been disbursed (vs. a projected US$ 137,666 disbursement) and two cooperative organizations (CAFESA and FED) are selling feed supplements and molasses to some 400 small-scale swine producers. The project is approximately six months behind schedule in terms of the participation of intermediaries and specific outputs, but the potential reach of the project (900 to 1,000 small-scale swine producers) is as projected. Table 5 details progress as of November 1985.

d. Commercial viability

Project administrators have monitored pricing policies of participating stores to ensure that adequate income would be earned on sales of the feed inputs. The stores sell the products at adequate margins, earning a 38 percent gross margin on molasses, a 19% gross margin on iniciador and a 20 percent gross margin on the 40 percent protein supplement. Project administrators adopted molasses as a feed input, despite its highly subsidized price. At the time of the evaluation the ex-mill wholesale price of molasses had increased six-fold due to unanticipated events. The price at retail stores went up a factor of 1.75 according to ATI. The ramifications of these changing factor costs are discussed in section 3e.

The ATI Project Officer and the Project's Technical Advisor indicate that it is too early to tell if the vendors will be profitable, since many participating vendors are new and are service-oriented, not profit oriented. Both CAFESA and the FED, however, have indicated their interest in operating the participating retail outlets as commercially viable enterprises and charging adequate margins. Technical assistance covering standard bookkeeping procedures and financial analysis is being administered by PROAPE, a subsidiary of APEDI. This assistance is the result of the working relationship

Table 5: Dominican Republic Swine Feeds Projected vs. Actual Project Objectives

	Targets by Project Completion	Cumulative Achievements at Mid-Point[a]
Promotion of Ramie as green feed for swine		
seed increase plots planted	4	2
seed increase plots total area	5 ha	2 ha
Feed Trial Demonstration Projects		
No. Established	3	2
No. Breeding Units	6	3
Detailed Records Available	3	1
Commercial Operations		
No. Potential Customers	2,000	1,000
No. Current Customers	1,600	400+
No. Participating Intermediaries	4	2
No. Retail Outlets	12	8
Sales Volume[b]		
Molasses	RD 100,000	RD 18,000
Concentrate	RD 550,000	RD 30,000
Other Feeds	RD 150,000	--
Veterinary Products	RD 50,000	--
Equipment	RD 50,000	--
Credit Fund Operations[c]		
Disbursed	RD 180,000	RD 64,375
No. Participating Intermediaries	4-6	3
Expended Funds (Equipment)	RD 30,000	RD 9,200
Expended Funds (Working Capital)	RD 150,000	RD 5,700
Total Expended Funds	RD 180,000	RD 14,900

[a]At mid-point of project life.

[b]Data taken from cumulative ATI project statistics as of July 1, 1985.

[c]ATI Project Status Report, October 23, 1985. p. 4.

developed by ATI and PROAPE--a recipient of financial assistance under a grant which preceded the AID-ATI cooperative agreement.

e. Outputs/impact

The feeds produced under the project are being marketed by the two large campesino-based cooperatives. They have access to over 1,000 potential small-scale producers and are already selling inputs to more than 400 farmers. On the production side, two hectares of ramie plots have been planted and two feed trial demonstration projects have been instituted. Other specific targets are outlined in Table 5.

3. Analysis and conclusions on CIMPA, CAFESA and the FED

a. Source of project idea

The Swine Feed Project was devised by the ATI Project Officer, the Project's Technical Advisor and a former head of CIMPA as a consequence of their professional background and familiarity with the Dominican Republic's pig repopulation program, which was partially funded by AID (see Section 3c1).

The project appears to be achieving substantive progress toward goals, despite the lack of explicit performance targets in the field against which progress could be measured.[4] This success is due principally to the outstanding efforts of the ATI Project Officer and the Project's Technical Advisor, both of whom exhibit a profound understanding of the operating environment and a high degree of professional commitment to achieving success. These two factors, in conjunction with their extensive training and experience in animal husbandry and their abiding interest in the discipline, suggest that ad hoc solutions will continue to be devised for problems and contingencies under the Swine Feed Project. For example, potential molasses price increases (see Section 3d below).

b. Capability

In addition to points noted (in 3a above), the evaluation team found that:

- The project is developing the requisite infrastructure for documenting research and development of alternative combinations to swine feed ingredients. This is a positive contribution to extant literature, which encourages the spread of this technology to other regions and developing nations;

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[4]ATI notes that these can be found in its project plan and in status reports in its files. Project participants in the field were unable to explain progress in reference to an overall plan.

- Efforts by ATI to improve the content of quarterly reports have resulted in increased statistical data collection and analysis, enabling ATI to monitor the project with greater control and precision; and

- Technical assistance relating to finance, record-keeping and accounting have been extended to project participants, ensuring that operations will be conducted on a financially viable basis.

c. Progress

Concrete progress was observed in the following areas:

- The project has successfully established a delivery system for pig feed rations using an existing ingredients mix and networks of rural retail stores;

- The project has moved point-of-sale feed ingredients closer to small-scale swine producers and has enabled recipients to purchase small quantities of inputs more appropriately tailored to needs and levels of disposable income;

- Project administrators have convincingly demonstrated to farmers that the intermediate feed technology is cheaper and more effective;

- Two ramie plots have been established and the use of ramie as a perennial source of protein and fiber for green chop feed has been established;

- The project has established one feeding trial demonstration project which provides baseline data on feed conversion ratios and comparative ration costs;

- Technical assistance relating to the intermediate feed technology has been provided to project recipients through the rural retail outlets; and

- Technical assistance relating to finance, record keeping and accounting has been provided to selected project participants.

d. Commitment

All parties involved exhibit a high degree of commitment to the objectives and methodology of the Swine Feed Project. A particular strength is the versatility of those directing operations in the field; project modifications have been promptly executed in response to the following changes in the operating environment:

- The implementation of the project found difficulties as PDAs, the planned second-tier implementing organizations, did not perform as expected.

  Either from a lack of interest and/or resolve, of those who initially subscribed to the project (the Moca Association), or the presence of competing donors who offer projects with less rigorous conditionality (the CEFASA Association).[5] Project administrators have selected cooperative organizations with direct/indirect linkages to merchandising outlets that have quickly integrated feed inputs into the mix of products retailed in their rural general stoves. Due to the non-profit orientation of these intermediate groups, extra efforts have been expended to ensure that adequate financial controls are established and pricing policies generate profits. Continuing technical assistance is being provided to develop the operating infrastructure required of commercial viability; this constitutes a very important secondary benefit of the project for recipients, both at the level of intermediate institutions and participating vendors;

- Molasses has been heavily subsidized through the government's price control mechanisms. Because of a new emphasis on free market policies and other pressures in early November 1985, the price increased by a factor of more than six. This situation clearly jeopardizes the commercial success of feeds based on molasses. Since the feeds developed through this intermediate technology have found ready acceptance by farmers because of the agreeable taste and the obvious nutritional benefits of the salsa (molasses) on the ensalada (chopped green foliage and table scraps), the success of the project may hinge on the development of a substitute for molasses. Project administrators have begun to revise the intermediate swine feed mix, and are currently looking for an acceptable substitute. They stated that preliminary investigation suggests the most likely choices are sugarcane juice (guarapo) and sugarcane syrup (miel rica), both of which can be produced economically in the provinces where the new feed technology is being promoted;

- Extension agents provided for in the project planning stages have not been allocated by the Minister of Agriculture, and project promotion and technical assistance to farmers have been curtailed. The project's Technical Advisor and administrators have tried to compensate for this by drawing on the resources of PROAPE, an organization providing technical assistance (both financial and managerial) to the micro-enterprise lending program developed by APEDI; both

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[5]CEFASA should not be confused with CAFESA; the latter is the group enrolled in the project.

PROAPE and CIMPA are subsidiary operations of APEDI. The use of PROAPE has enabled the Swine Feed Project to provide much needed business management training to project recipients, but the shortfall is still evident for promotion and animal husbandry assistance to the farmers. This may have contributed to the project's current overall lag behind schedule. Project output goals have been scaled down to match project team capacity;

- o Import restrictions are creating increasing price pressures on the ingredients constituting the protein supplement, especially soybean cake. The project's Technical Advisor is now experimenting with substitutes available locally, such as rice and/or wheat bran;

- o Sales of the pig weaning ration have exceeded expectations; farmers seem to appreciate the tangible impact of using this feed at a critical stage of animal growth, and have begun to feed it to other farm animals such as chickens, ducks and turkeys. This unanticipated response has provided secondary benefits to farmers' income-generating activities; the scope of the swine feed project is being modified to accommodate this development. Table 6 illustrates the strong demand for weaning feed;

- o The credit voucher scheme proved to be unnecessary. Indeed, there is sufficient credit in domestic financial markets to supply demand generated by the Swine Feed Project and more. CIMPA continues to provide loans to the second-tier intermediate organizations when needed, and recently began channeling these operations through the Fondo Para El Desarrollo (FONDESA), the financial institution created by APEDI to administer PROAPE's loan portfolio. This project modification has facilitated disbursement procedures, simplified control mechanisms, and improved loan supervision and administration; FONDESA has access to local credit lines and the resources to administer financial transactions and loan portfolios.

ATI funds the salaries of CIMPA's personnel. The salaries of personnel involved in the project are paid from revenues from feed sales. The Evaluation Team believes that this situation has not impaired the implementing organization's commitment to the project.

e. Risk and marketability

Two major changes occurred over the course of project implementation. The price of molasses has risen so high that it may be beyond the reach of small-scale producers--thus compelling project managers to look for a substitute. Project managers must also be prepared to suggest a new source of protein in case the price of imported soybean meal (the present source of protein and the most

Table 6: Dominican Republic Swine Feeds
Spot Survey CAFESA Stores

Location	Clients	Geographic Reach	Months in Operation	No. Sales Molasses	No. Sales Pig Weaning Food	No. Sales Protein Supplement
Tres Cruzes	100	8 km	7	75	240	0
Salcedo	20	4 km	8	180	435	30

Source: Evaluation Team field visits

expensive component of the feed) rises beyond the purchasing power of the users.

The project plan established effective demand based on a survey of 55 farmers' groups conducted by APEDI and funded by an ATI mini-grant. Preliminary interviews were also conducted at feed stores to determine supply and demand conditions for complete (or balanced) feeds and partial (40 percent protein) feeds. Response to the intermediate feed project has been strong, affirming the conclusions of these two pre-project surveys.

The challenge facing project administrators now is to find a substitute for molasses. Guarapo and miel rica can be produced economically in existing small sugar mills that are connected with sugar cane plantations. No contingency planning was evident for this aspect of the project to date, and project administrators will have to improvise their response to this critical situation. A slow response to this problem may increase overall project risk levels and decrease the project team's risk-management capability. ATI feels that risks are reduced by keeping options open and by employing people who are knowledgeable about animal nutrition and feed business.

Available statistical data from participating store records and quarterly reports suggest that additional technical assistance may be needed to achieve project objectives. Sales of the 40 percent protein supplement have been comparatively low, while sales of molasses and pig weaning feed have been high (see Table 6). This means that farmers are not providing the balanced ration devised by project sponsors. Therefore it can be assumed that swine receiving the feed are not going to grow, gain weight and reach maturity at the same pace as feeding trial demonstration swine.

This may increase the costs of using the intermediate feed technology, since purchase of intermediate feed inputs may not yield expected planned results. Sales of pig weaning feed are high because results are quickly and concretely perceived; diversion to other farm animals is conceivable because ducks, turkeys and chickens have much shorter growth spans and the impact is readily apparent. The impact of the 40 percent protein supplement is not as visible since it is fed to maturing pigs. Farmers may actually be unable to understand the value of using it. The planned increase in technical assistance would correct this situation and may ultimately increase demand for the intermediate feed technology.

f. Information flows

Information channels to provide essential feedback established within the Swine Feed Project are in varying stages of development. Those relevant to project implementation and reviewed by the evaluation team include:

- The project plan called for a socioeconomic baseline study of small-scale farmers to be conducted by the sixth month of project implementation; this study is only now being implemented. If this study had been conducted, information directly bearing on project design and modifications might have been collected. Specifically, for example, the project designers wrongly assumed that an ATI-funded credit fund was needed for feed purchases. In fact, financial resources allocated for this type of credit were not used, and were de-obligated. Notably, the project plan states that "conventional production credit is available to the target group from sources other than the project, such as the National Agricultural Bank."[6] In general, data on project beneficiaries which will be essential for project design and future project evaluation has not been gathered.

- Quarterly reports, as noted earlier, have steadily improved over time both in content and organization. The Project Manager's decision to increase statistical data sources has been instrumental in this regard.

g. Replicability

The Project Manager and administrators have worked to develop feeding trial data (feed conversion ratios and comparative ration unit cost structures) that will document the impact of the hard technology developed under the Swine Feed Project. The contribution of the soft technology--i.e., the system for moving the inputs to small-scale users and for combining the sales and education functions--will also be documented. Insights may have direct impact in similar ongoing projects in Colombia and Mexico. This swine feed alternative is relevant to the experience and prospects of other developing countries that have similar natural resource endowments.

h. Key inputs

ATI has supplied direction, technical assistance and financial resources to the project. CENIP and CIMPA have contributed human resources, ramie increase plots, feed trial demonstration facilities and extensive technical assistance. PROAPE has supplied business management technical assistance. ATI's role has been that of project developer and facilitator in an arrangement with institutions which have provided outstanding technicians.

4. Other ATI projects in the Dominican Republic

In addition to the Swine Feed Project, ATI is furnishing technical assistance and training to a small-scale manufacturer of tricycles which will enable him to produce the Hotchkiss Wheelchair.

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[6] "Project Plan", Assistance to Small-Scale Swine Producers, p. 14.

The entrepreneur was identified by staff from the PROAPE microenterprise lending program, which will provide working capital loans for the entrepreneur when production begins. The entrepreneur completed training in Oakland, California in November 1985, and is in the initial stages of setting up wheelchair production capacity. The Evaluation Team's findings on this project are described in Chapter IV of this report.

C. ATI Links to Other Organizations in the Dominican Republic

1. Donors (USAID)

The ATI/CIMPA Swine feed project complements the AID/CIMPA/OPC project for swine repopulation in the Dominican Republic. AID monies were used to set up hog raising facilities at the CIMPA farm where, under the program, many generations of purebred pig stock from nine genetic races have been born and nurtured. These pigs have contributed to overall efforts to repopulate the island with pigs. Although the ATI Swine Feed Project neatly dovetailed the AID project (now nearing completion), it was done without establishing direct linkages. Cordial relationships and open communications have been encouraged by the ATI Project Manager, and AID was found to be in favor of the project but nominally informed about it.

2. Other organizations

The ATI Swine Feed Project has been subject to competition from other international development projects working with animal husbandry. The project plan identified an important regional cooperative, CEFASA, as a potential project participant, but before the ATI project was operative a European Foundation began a project to develop a feed formulation facility through CEFASA that provided substantial financial support and numerous subsidized inputs. The operation is now functioning but is not self-financing. CEFASA's participation in the ATI Swine Feed Project was precluded by this development.

The ATI project touches tangentially on the work of Enda del Caribe, a European based appropriate technology organization. Four volunteers are currently working with the FED, focusing on naturalistic health care and on ecology.

CAFESA has entered into a project with the Heifer Foundation under which CAFESA members are given a female pig. In payment two offspring are returned to the Foundation, and the rest are sold to small farmers, thus contributing to pig repopulation efforts. Participants are receiving wheat bran on a subsidized basis.

III. FIELD OPERATIONS IN COSTA RICA

A. ATI's Planning and Field Operations in Costa Rica

1. History

A Lime Kiln Project is the first ATI involvement in Costa Rica. ATI's presence in the country began in 1982, when its Minerals Development Specialist attended an AID-funded conference and met the head of the construction materials department of the Instituto Technologico of Costa Rica (ITCR).

ATI is now planning to continue its development work with a second project. Consideration is given to implementation with the collaboration of ITCR and the Asphalt Institute of the United States. It is an idea of ATI that may result in a project for the transfer of proven technology for the development of asphalt-reinforced roofing sheets.

2. Development constraints, problems and opportunities

Costa Rica is one of the most advanced nations in Central America, both in terms of economic development and social and political development. Certain indexes of development and prosperity--such as the literacy rate, average life span, live birth rate, etc.--substantiate this assertion. Costa Rica has a growing diversified manufacturing sector, but depends primarily on commodities (such as sugar, coffee, bananas, etc.) for export earnings. The level of infrastructure (road and highway networks, air and rail transport, electricity, water, etc.) is relatively well-developed and uniform throughout the country. Perhaps the biggest constraint Costa Rica now faces is increasing balance of payment pressures. The country's foreign debt, unfavorable balance of trade, and the need to finance a high budget deficit will constrain public expenditures for the near-term and may further depress GNP growth, which has been static or declining since 1979.

B. The Implementing Organization and the Project in Costa Rica

The implementing organization for the lime kiln project No. 84-13, is Instituto Technologico of Costa Rica (ITCR). Table 7 summarizes the project.

1. ITCR description and findings

a. History, current activities, funding

ITCR is a government-funded educational institution created in 1973 as a center for both training and research in the applied sciences (engineering, construction, forestry, agronomy,

Table 7: Lime Kiln Technology Project Summary

Region: Latin America/Caribbean	Project No.: 84-13
Country:	Costa Rica
Location of Project:	Patarra
Name of Project:	Lime Kiln Technology
Implementing Organizations IO:	Technical Institute of Costa Rica (ITCR) and National Lime Producers Cooperative (CONOPROCAL)
Productive Activity:	
Starting Date of Project:	May 1, 1984
Number of Months Elapsed at Time of Evaluation:	18 months
Scheduled End of Project Date:	October 31, 1986 (to be extended to February 28, 1987)
Total Funding:	$59,700 (kiln development) $84,814 (revolving loan fund)
Purpose of Project:	To develop an improved lime kiln for use by local village cooperative members and other small scale lime kiln operators.
Description of Technologies:	The project will use a wood gasification process in locally redesigned lime kilns. The redesigned kilns enable continuous production as opposed to traditional batch production. Design changes include the firing funnel, a sliding ramp to allow continuous discharge, the combustion chamber and heat tower, a heat circulation system and a wood feeding funnel.
Disbursed thru October, 31 1985:	$40,401

energy, animal husbandry, business administration, etc.) which could supplement existing programs in the Costa Rican higher education system. The institution operates a main campus in Cartago (30 km from San Jose) and two extension schools, and has achieved a reputation for theoretical and academic excellence during its short history.

Professionals in the Research and Extension Program (some of whom are working with the ATI project) are employed full time, carry no teaching loads and receive funding for materials, laboratory equipment and salaries from ITCR's general budget. Discussions with ITCR's Executive Director (the "Rector") revealed that the institution assigns high priority to its research efforts in appropriate technology fields (reflected in its financial and administrative support of the program) and that it aggressively seeks out innovative, imaginative projects that address national needs within stringent budgetary constraints.

b. Purpose and objective of the project

The project objective is to improve efficiency in the local production of quality lime currently not available in Costa Rica, and to disseminate the new technology when the necessary research and development activities are concluded.

It was assumed at the outset that the development of a new or improved kiln model would:

- Reduce firewood requirements by at least 30 percent;
- Reduce labor requirements for the calcination of limestone by at least 25 percent;
- Improve occupational health and safety;
- Improve the quality of lime for the expansion of sales in the agricultural sector; and
- Strengthen the working relationship between the ITCR and CONAPROCAL, thereby developing a model for private/public sector collaboration.

The purpose of the project is to improve kiln design to enable continuous production of lime, as opposed to the traditional batch production technique used for centuries in the industry, and to create the necessary mechanisms to fund the adoption of the new technology by at least 27 lime-producing businesses.

Technicians at the ITCR feel that if the prototype kiln finished in November 1985 functions as anticipated, Costa Rica will have developed its own, new lime production technology. The performance of the kiln will match the performance specifications of a parallel flue kiln developed in Germany, and will be more suitable for small scale applications.

c. Description of the technologies, including the process/mechanism

ATI, working with ITCR and the National Cooperative of Lime Producers (CONAPROCAL)[1], started the project on May 1, 1984. The project encompasses three phases: research and development related to design and construction of prototype kiln models; local dissemination through training and credit to finance kiln conversions (using an ATI-funded revolving credit line); and regional dissemination of the new lime kiln technology through seminars, publications and consulting services.

ITCR is the designated implementing organization, providing all technical inputs to the project. CONAPROCAL represents the prospective beneficiaries--the lime producers operating in Patarra, where almost 80% of the nation's lime is produced--and serves as a crucial link in efforts to market the new technology to the lime producers and as the financial intermediary passing ATI credit funds allocated to finance the kiln-modification projects of the lime producers. The first phase of the project is nearing completion. The work has taken place in the laboratories of the ITCR and in the locality of Patarra, where CONAPROCAL operates.

A half-scale model was built to prove the viability of an operating mode characterized by continuous burning of limestone instead of the costly batch mode that had been used for centuries. After three major design changes (two at the blueprint stage), ITCR developed an acceptable model for the first modification of an existing full-scale kiln.

For the operation of the new model, the limestone does not have to be cut in different sizes for different levels of the loaded kiln nor does it require laborious hand loading, as had to be done for the less efficient batch mode. Now the size of the rocks can be uniform throughout the kiln and thorough burning is achieved by a time-controlled exposure of the material to the fire, since the limestone flows by the force of gravity (as it is gradually calcinated) to a discharge orifice at the center of an arched funnel poised atop the fire chamber at the bottom of the kiln.

This funnel is the product of arduous experimentation with materials and shapes. It is strong enough to serve as the floor that supports the entire load of limestone and the frequent impact of tons of lime as it constantly caves in and collapses on its way to the discharge port. The funnel is heat-resistant as is also the grill separating the limestone being burned and the fire, which is maintained at constant temperature in the adjacent vaulted chamber.

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[1]The cooperative does not have national coverage as its name suggests.

The material for the funnel and the lining of the kiln is limestone with a high silica content. It abounds in the area and it is already being mined to complete modifications of the kiln's most recent full-scale prototype which will be fired for testing purposes before the end of December 1985 (the previous model was half scale).

The internal temperature of the kiln is maintained uniform throughout the constantly dropping load. This is achieved by effectively monitoring and controlling the temperature in the fire chamber and the rotation and supply of air throughout the kiln shaft. The control system was developed by ITCR after observing that the limestone was not being burned as thoroughly at the front of the load.

To create the necessary vortex inside the kiln and to equalize cross-sectional temperatures, two tangential tunnels are installed in the front and back of the cylindrical kiln for the control of the air supply. This control is exerted by the kiln operator, who also controls the kiln's internal temperature by regulating the mixture of fuel and air. One floor below, the lime is drawn out of the kiln as it drops through the funnel and is carted to the hydration vats, the mill, or the storage area.

The purpose of this two-floor arrangement is to minimize the operators' exposure to heat and to expedite lime removal as it constantly streams from the kiln. It is noted that although the new kiln requires less labor and fuel to operate, the larger quantities of lime being produced generate employment in the processing of limestone for the kiln and in the processing of high quality lime for diverse uses.

If the kiln works as expected, it will be a significant technological breakthrough for the industry--in all countries producing lime and using wood as fuel.

d. ATI funding and counterpart funds

A total of US$ 144,514 was allocated by ATI to the project. ITCR received US$ 59,700 for developing the kiln technology (US$ 32,601 of which had been disbursed by October 16, 1985) and CONAPROCAL, in the Town of Patarra, received US$ 84,800 (US$ 7,800 of which had been disbursed by October 16, 1985) for establishing a revolving loan fund to finance the new kiln technology. The decision to apportion grant funds between two implementing organizations came at the behest of ITCR, which expressed reluctance at administering the revolving loan fund.

Funding for the operations of ITCR is provided by the Costa Rican government. Its budget is an item in the national budget. At the insistence of the evaluation team, an attempt was made to compute the expenses incurred by ITCR. It was preliminarily established that it

had invested in the project at least as much as ATI had invested (in terms of direct cost outlays).

e. Progress to plan

The project was 18 months into its 30-month cycle when the evaluation team visited the site. According to the ATI Project Officer, implementation is six months behind schedule due to administrative lags and difficulties in designing the modified kiln's structure such that specified lime quality and volume would result. To date, US$ 40,401 of the US$ 144,514 project grant (30 percent of the total) has been disbursed. The project has been operating for 19 months and was originally scheduled to be completed by October 31, 1986.

ATI monitors project implementation through periodic visits of the Minerals Development Specialist and the Project Officer. No major problems have been identified and all parties to the project agreement concurred as the effectiveness of the implementation framework. Initial project implementation took place without major delays or modifications. The legal agreement was issued by ATI on May 1, 1984, and was ratified by the cooperative on June 5, 1984.

The first and only amendment to the ATI project was issued by ATI on July 24, 1985, authorizing the purchase of a four-wheel drive vehicle and some materials in the United States. ATI was authorized to pay the suppliers directly for these items. No increase of the ATI grant was necessary.

With respect to the second part of the plan--creating mechanisms to finance both the purchase of a grinding mill and the structural modification of at least 27 local kilns--the evaluation team learned from the manager of the cooperative that the revolving loan fund may not be necessary.

The implementation schedule provides for project completion by October 31, 1986. Because of project delays, kiln modifications by cooperative members, and modifications of the implementation plan to include product processing operations--mining, crushing and sizing, slaking, milling and packaging--the project will be extended until February 28, 1987.

Through interviews with the project participants it was learned that four economic studies were to be undertaken.[2] Two of these were specified in the original plan--an economic profile of four lime producers, and an analysis of CONAPROCAL operations. A study of the fuel problem and its solution, and an economic analysis of participating operators will be provided for in the modified plan.

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[2]According to ATI, all except the CONAPROCAL study were carried out. The latter was deferred.

On the monitoring and control systems, ITCR reportedly has an accounting system that tracks budgetary expenditures. However, ITCR assumes no accountability for research projects that are not part of the budget approved by the government. These are not entered in the accounting system. For this reason, the actual cost of developing the technology will probably never be known. In this project, while preliminary estimates indicate that the new technology will result in profitable lime-producing activities, the total cost assumed by Costa Rican and US taxpayers in the development of the technology is not estimated.

As for quality control, ITCR is also planning to set up a quality control station in Patarra, to help lime producers in the standardization of lime quality.

Based on the outcome of tests with the prototype and the results of a recently-completed socioeconomic baseline study, dissemination of the new kiln technology will begin in Patarra. CONAPROCAL's participation in this phase of the project may not be as active as was originally planned due to information gleaned subsequent to the project agreement. ATI feels that this will improve the chances of achieving the project goal and purpose. The evaluation team is confident that project participants will resolve this situation.

Finally, several unknowns need to be resolved in this project.

- o The market study should be completed to allow development of marketing plans;
- o Production cost information should be generated and analyzed;
- o The availability of fuel sufficient to attract the investment resources to exploit the new technology--at optimal capacity over a specific period of time--is simply not evident;[3] and
- o Product testing and demonstration sales need to be done to ensure both the existence of a market and the price the improved lime will command.

2. CONAPROCAL, description and findings

a. Business objective

The cooperative was to be the secondary implementing organization. It was created to support the lime-producing activities of its members through credit and marketing services. Under the

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[3]ATI does not agree that there is a fuel wood supply problem.

leadership of Mr. Juan Bautista Monje Muñoz, the membership will all benefit, as will other lime producers, from the most significant development in the history of lime production in the country.[4] A significant impact is assured since lime production has been a principal economic activity in Patarra for centurie and the economic and political influence of the cooperative are unquestionable.

The cooperative's value to the ATI project lies in the political and social leadership of its manager. As the project began to develop, however, certain facts became known that have caused both ITCR and ATI to change their plans for CONAPROCAL's future participation in the project. Although its manager has expressed interest in using the new technology, no plans have been revealed for strengthening the institution and for expansion of its operations to benefit from new opportunities.

In addition, the membership of the cooperative (mostly relatives of the Manager) seem to have lost control of its administration. In fact, most kiln operators are neither members of CONAPROCAL nor do they sell their lime to the cooperative.

At present, ATI and ITCR are considering possible revisions in CONAPROCAL's planned participation in this project pending the successful outcome of the lime kiln prototype. Although the cooperative's role to date has been largely passive, its staff's ability to work with the personnel of ITCR and ATI was recognized by the head of the ITCR and by the Project Officer of ATI. For the implementation of the project, the cooperative controls a petty cash fund (used to pay overtime salaries of ITCR personnel) and the ITCR provides the human resources needed in the development of the new technology. This collaborative style has worked well and is expected to function until the end of the project.

The cooperative complies with government-required reports on the financial results of its operations and its books are allegedly audited by independent accountants. However, the manager could not or was not willing to provide a clear picture of its financial strength or profitability to the Evalution Team. ATI received from the cooperative only "accredited statements of assets and liabilities." No comprehensive financial analysis of the cooperative was available anywhere.

b. Description of overall system

Whether as a member of the cooperative or as an "independent," the lime producer will have access to the new

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[4] ITCR's Department of Social Services Extension will probably be working with cooperative members to assist in the process of technology acceptance and as facilitators between the technical unit and the users.

technology. Production of lime will start at the limestone quarry. Improved mining (by removing the top soil and broadening the open pit) will eliminate contamination of the limestone. The rock will be blasted, crushed, and homogenenized before it is transported to the kiln. Once at the top of the kiln, the material will be poured at a constant rate and will be calcinated as described under Section B.1.c above.

Processed lime will be carried from the storage area to the end users' facilities through existing channels of distribution. The end users currently contemplated are builders, road construction companies, leather tanners, coffee growers, sugar producers, and other agricultural users.

c. Commercial viability

The marketing strategy for this project involves consideration of the market for the technology being developed by ITCR and of the market for the quality lime that is likely to be available in 1986. The following treats these aspects, starting with the market for lime.

(1) The market for graded lime

ITCR could not provide a detailed profile of the market for graded lime in Costa Rica. The Project Plan indicated that most of the expected future demand for lime would be generated by the agricultural sector. Since the project began to be implemented, however, this assumption has been modified.

Now the cooperative and ITCR expect a surge in yearly demand from the Ministry of Public Works and Transportation[5] for 50,000 tons of lime for road construction. Considering that the requirements of lime for ground stabilization are about 80 tons per kilometer, this figure would indicate that the Government plans to construct and improve about 625 kilometers (375 miles) of road per year.

Neither the ITCR nor the cooperative knew if budgetary allocations were forthcoming for this amount of road construction.[6] Nevertheless, they estimated that the demand for road construction would be about 95 percent of future effective demand and that the other 5 percent would be absorbed by the sugar mills for sugar manufacture and by the tanning industry for processing of skins. Therefore, to meet internal demand, they must eventually produce yearly about 53,000 tons of lime, or about four times the amount of lime being produced at present. There is also a potential export market that has not been quantified.

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[5]Ministerio de Obras Publicas y Transportes.

[6]Due to balance of payments difficulties and related IMF commitments, government expenditures will be tightly controlled and restrained in the medium-term future.

With respect to the potential lime consumers, the cooperative and ITCR expect that the demand will be stimulated by the availability of lime. The consumers have been reluctant to advance estimates of their needs without knowing the quality and price of the lime that will be available. Nevertheless, a preliminary estimate of commercial viability can be produced here using the cost and demand estimates of ITCR's technicians (see Tables 8 and 9). They say that the cost of producing one ton of lime will be reduced from 1,825 Colones to 1,530 Colones--a decline of 16 percent of current costs. Production with the new kiln may be 850 tons per year, or slightly over three times the production of the old kiln. Hypothetically, there are in the country 57 kilns that, if modified,[7] could produce some 48,500 tons of lime. Modification of these kilns would cost 8.6 million Colones (150,000 Colones per kiln). For the production of the remaining 4,500 tons of lime, five kilns would have to be constructed at the cost of 1.2 million Colones (230,000 colones per kiln). Therefore, the total new investment required for the new production could be as high as 10 million Colones. The cooperative is now selling a ton of low-quality lime at 2,400 Colones retail and 3,000 Colones wholesale--after buying it from the producer at 1,800 Colones. If the producer holds the current price, his margin over cost operating the new kiln will be 270 Colones. However, the Manager of the Cooperative indicated that the new price paid to the producer for high-quality lime could be as high as 2,200 Colones per ton.[8] This will increase his margin over cost to 670 Colones.

Therefore, the total yearly margin to the producers from selling 53,000 tons of lime may amount to 35.5 million Colones, which would amply cover the payment of 4 million colones per year for principal and interest in credit of 10 million Colones at 25 percent per annum and four years term. The investment appears very attractive if the investment climate in the country continues to be favorable and if potential lime producers can be assured of availability of fuel.

(2) The supply of fuel

The fuel problem relates to the availability of wood to produce lime under the new technology being developed.[9]

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[7]There is no plan for expansion of installed capacity for prompt and efficient exploitation of the new technology.

[8]This is a conservative estimate for ATI states that the producers are already selling low-grade at up to 2,600 Colones per ton.

[9]ATI disputes that fuel wood supply is a problem. Most lime producers are reportedly using scrap lumberyard wood, a low value byproduct which is economical and currently available. In the aggregate, the amount of fuelwood used by the lime industry is miniscule relative to that used in household cooking. In any case, the improved kiln technology reduces fuel requirements for existing producers.

Table 8: Costa Rica Lime Kiln: Production and Installed Capacity of Lime Kilns

	Old Kiln	New Kiln	Percent Change (rounded)
Cost of Producing One Ton of Lime	1,825 Colones	1,530 Colones	-16%
Production of One Kiln	280 tons/year	850 tons/year	300%
Kilns in Production in Cost Rica	57	57	no change
Total Annual Production	15,960 tons	48,550 tons	300%

Source: ATI Staff, November 1985.

Table 9: Costa Rica Lime Kiln: Investment Required to Supply Estimated Demand[1] for Lime

		Total (in Million Colones)
Modification of Existing Kilns	57 x 150,000 Colones	8.6
Construction of New Kilns	5 x 230,000 Colones	1.2
Contingency		.2
		10.0

Source: ATI Staff, November 1985.

1. ITCR technicians estimate total future yearly demand for lime at 53,000 tons.

Project managers need to discover as soon as possible whether there will be enough fuelwood on a continuous basis to ensure the recuperation of the investments made in the modifications of the kilns. If the answer is not affirmative, the availability of capital and, indeed, the utility of the new technology itself becomes a moot issue.

Recent estimates indicate that current deforestation in the country is about 60,000 to 70,000 hectares per year. This is equivalent to more than 1% of the country's land area or 4% of the forests remaining in 1977. At this rate of deforestation, the unprotected forests will be gone before 1990.

The ITCR sponsored a study of the deforestation problem and of its solution with respect to the production of lime. It was confirmed that given the current yearly net decline in Costa Rica's wood resources, within three to five years there would be no wood available for the production of lime.[10] The suggested solution was to invest US$ 500,000 in a reforestation plan for the area of Patarra. Under the plan, wood would be available in five years but the return on investment was estimated at below 8 percent.

This relatively low return makes the reforestation project unattractive for private sector investors. However, in view of the projected demand for quality lime for agricultural production and industrial uses, and of the potential economic impact of domestic availability, the reforestation project could be combined with a project to increase the capacity to produce lime.

From the macroeconomic standpoint there is no information about the Government's position concerning reforestation for fuel production, nor whether this type of project would have high priority in a large reforestation effort. It is known that there is urgent need to reforest 450,000 ha and that discussions are in progress regarding the possibility of a US$ 60 million loan from the Inter-American Development Bank for a large reforestation project (at an average cost of $500 per ha, this will reforest only 120,000 ha.).

In view of the preliminary stage of these discussions and of the time it takes to process the type of financial assistance under consideration, ITCR could also study the costs and benefits of burning coal (now available at less than 600 miles by water)[11] or, as stated

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[10]ATI has asked ITCR to be sure that the final study devotes more attention to the question of availability of scrap lumber.

[11]Although ATI asserts that no coal was available at the time the project was formulated and approved, the ITCR could study the potential benefits of using coal with a caloric content of 1,200 BTU/lb, or 6,670 kilo-calories/kg, available in Puerto Bolivar, Colombia. The price quoted by CARBOCOL for this year is $41.53/tonne plus a transportation cost to Puerto Limon of about $6/tonne. Prices for 1987, 1988 and 1989 will be $46.49, $49.13 and $51.94 per tonne, respectively, and transportation cost would increase 70 cents per tonne per year.

earlier, combining a nation-wide kiln modification program with the reforestation project. If no solution is found, a possible delay in the dissemination of the prototype kiln modifications, already near completion in Patarra, may prove to be costly.

A related major issue is the approach followed by the ITCR and ATI in the justification of the project. The Evaluation Team found that the project design did not provide for a financial analysis to establish the merit of engaging in the development of a new technology that depended on the availability of an already scarce fuel. ATI states that there is no scarcity of wood for current lime reproducing activities. Even though the new kiln will use one-third less fuelwood, what assurance is there that there will be enough wood so that the future lime producers will be able to contract debt to benefit from what happens to be a very attractive market?

While it seems possible that funding for the reforestation project will be found, information is needed on its source, and on other possible alternatives. The solution may have to come from the private sector, given the current serious budgetary constraints under which the Government operates.

(3) The market for the new technology

With respect to the market for the new improved kiln technology, the ITCR completed a survey to define and study the socio-economic profile of the lime producers in Patarra. Based on its findings, ITCR will develop a strategy to market the technology among them.

Early computer runs have identified the leaders of the community, overall economic status, and the thinking of the population with respect to their lime-producing activities. Of all the workers, 50 percent believe that they are well-paid and 30 percent feel there is room for improvement. There is accurate information about the take-home pay of every family head at every income level. With respect to home ownership, 85 percent of the people own their dwellings. No correlation was found between income level and formal education.

Of all persons interviewed, 50 percent believe the lime production process cannot be improved. There is total agreement that the most difficult jobs in the present technology are loading and burning the limestone and the retrieval of the hot lime at the end of the burning phase. ITCR expects to make good use of this information in designing its marketing plan for the technology. For this marketing plan, there is also a need to ascertain the cost of producing lime when operating the modified kiln at optimal capacity. The Institute and ATI know that only on the basis of a clear and accurate estimate of potential profitability can the investment in kiln modifications for increased production be justified.

d. Outputs/impact

The ITCR is convinced that all the technological problems have been solved with the exception of the availability of fuel, and that the test of the prototype kiln will be successful. Technicians are also optimistic about the effectiveness of their marketing plan for the technology because their survey to determine the socioeconomic profiles of the lime producers was successful.

So far most of the impact of the project has been in terms of the work generated at the Institute and in the construction of half-scale models and the full-scale prototype kiln. Although no specific budget allocations were made by ITCR to the project, all the activities have been adequately supported. It was estimated that at least 50 persons have participated. To date, the Institute has contributed five person-years of professional staff time exclusive of non-professional staff participation. There have been cameramen, secretaries, drivers, experts in administration, writers, and others involved in this project.

3. Analysis and conclusions on ITCR and CONAPROCAL

a. Source and ideas

ATI first learned of the ITCR's lime kiln technology project in 1982 when ATI's Minerals Development Specialist attended an AID-funded conference in Central America and met the head of the ITCR construction materials department. Subsequent to this meeting, ITCR submitted a proposal to ATI for support in developing the kiln prototypes enabling continuous processing of limestone resulting in a more uniform, higher quality product.

Given the high degree of institutional commitment, technical proficiency and support that ITCR embodied, and given the nature of the project (which was directed to enabling small, rural kiln operators to increase productivity, output and incomes), the decision by ATI to support the Lime Kiln Project was quickly approved by the external Project Review Advisory Committee in December, 1983 after 18 months of gestation. ATI's Executive Director held off on signing the project until more information was obtained in March of 1984 on 1) estimated fuel savings using the new technology, and 2) a preliminary commercial analysis of existing lime kiln operations. The project plan was signed in May of 1984.

In conversations with the Evaluation Team, the team leader at the ITCR stated that funding for the project would have been available in Costa Rica. He added, however, that the normally lengthy procedure for obtaining funding would have rendered the project unfeasible and that ATI was able to respond faster than any known institution in the country.

b. Capability

During the Evaluation Team's appraisal of the approach adopted by ITCR for developing the new technology, it became evident that the technical qualifications of all professionals involved in the formulation and implementation of the research for the development of the new kiln were unquestionable. However, they did not have information to show that an attempt had been made to go beyond the staging of their efforts to specifying critical decision points to track the outputs of each stage and corresponding expenditures. The use of the well-known Line of Balance Management Guide[12]--or an adaptation of it--could have been considered to track achievements in relation to specified technical requirements and budget.

In a sense, the Institute was charged with the development of the technology that is to be bought by the kiln owners. Since the development cost and appropriateness of the technology are fundamental issues, ITCR could also consider--in future projects--the use of the Acquisition Management Technology.[13]

Based on conversations with ATI's Project Officer and Mineral Development Specialist, and with ITCR's and CONAPROCAL's top executives, and upon examination of ITCR's facilities and operations, the Evaluation Team concluded that it would have been hard, if not impossible, to find better qualified institutions for the implementation of the project.

The project's secondary implementing organization, CONAPROCAL, is the best organized entity in lime production and marketing in the country.

c. Progress

Even though there was no detailed plan for management information and accounting and financial control systems were not available, control over key activities in the first phase of the project has been effective--the experimental phase appeared to be on course, for the development of the prototype kiln. The Evaluation Team noted, however, that because of the indifference to standard information-gathering practices, replication and improvement of their work will be difficult.

ATI and ITCR personnel ignored a fundamental need to know at any time the characteristics of the development plan and progress under it, the cost of developing each facet of the technology, and the productivity of the research team. Although ATI monitors its own

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[12]US Government Printing Office: 1966-O-222-579.

[13]US Government Printing Office: 1971-OL-475-129.

expenditures, the actual cost of each facet of the project could not be obtained from ITCR.

d. Commitment

From ATI's perspective, the unique feature of ITCR is that it supports a program of applied research and extension education that includes the same priority technical fields as those in the ATI/AID Cooperative Agreement. ITCR's research efforts are defined by both national priorities and the country's resource endowment and are targeted at five distinct disciplines: industrial technology (agro-industry and wood-processing), nonconventional energy, housing (construction and building materials) and occupational safety.

On commitment at the government level, given current budgetary constraints that prevent the execution of other high-priority research and development projects, the management of ITCR feels, and the Evaluation Team concurs, that the human resources now represented by the staff of the institution are largely underutilized, and that the nation may be incurring a significant opportunity cost.

The Institute is strongly interested in appropriate technology and is committed to its development and to dissemination and adaptation of imported technologies. In general, the support provided by ITCR has been adequate and timely.

e. Risk

If risk is the chance of adverse results or financial loss, risk assessment should be the first step--in an affordable risk-management plan--to determine the probability of such results or losses. In lengthy conversations with ATI and ITCR personnel and reading available material, it was evident that project risks were not systematically identified and adequately assessed. The Evaluation Team could not obtain from either organization written policies and procedures for risk management; for identification of markets, effective demand, energy sources and other inputs; and for determination of potential profitability.

During the review of the project it was apparent that neither organization was prepared to develop measurable criteria to identify success in project implementation beyond the technical performance of the improved kiln. Nor had ATI or ITCR adequately considered conditions that could hamper or assist in the achievement of project goal and purpose within the limitations of time and available resources.

Only now are project managers beginning to perceive that (1) this project calls for a strong marketing effort since market segmentation will be necessary and (2) logistical arrangements to control lime quality (i.e., standardized product) will have to be planned and executed in a cost-effective manner. Preoccupation with lime

production technology, then, has created serious oversights whose effects may be costly to overcome because more financial assistance and/or time will be required.[14]

f. Marketability

The need for quality lime in Costa Rica is unquestionable, however the magnitude of the market has not been established. The technology will be marketable and kilns will be modified if the technology under development proves to be appropriate, the cost estimates of ITCR and CONAPROCAL are accurate, and the availability of wood for fuel is guaranteed for at least ten years.

ITCR has taken the position that development of the technology is the first priority and that effective demand will develop as the supply of lime increases. In view of the uncertainty about availability of fuel and the apparent magnitude of the unsatisfied demand for quality lime, the project is not focused on the fundamental problem of how to produce and sell lime economically to create wealth and stimulate economic growth through the profitable replication of a successful kiln prototype. It remains uncertain whether the Institute and ATI used time and resources to develop a better technology to burn needed limestone with non-available fuel. The market studies sufficient to estimate the demand for quality lime and the supply of fuel wood have not been completed, though it has been two years since the project concept was first presented.

g. Information flows

The inadequacy of information about the markets for the technology and the quality lime, about the financial performance of the Cooperative and independent lime producers, about the actual costs incurred in the development of the technology, and about the Government plans to solve the serious problems caused by deforestation, indicate that ITCR and ATI did not make a sufficiently comprehensive analysis of the factors affecting project formulation, approval and implementation.

Given the scarcity of government funds, all or part of the costs of developing highly profitable technologies should be recuperable by ITCR (the current terms of the AID-ATI Cooperative Agreement notwithstanding) to support the conduct of research and development activities in other priority areas. The adoption of the technology by the kiln operators will be based on a convincing demonstration of the potential profitability of the new kilns. If the actual costs of developing the technology can be shown, it will be possible to provide for an equitable return to ITCR for the development of the new technologies from the profits of the new ventures formed to exploit it.

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[14]ATI has extended the project by one year with no further increase in cost.

The channels of communications that are open are adequate to maintain contacts among the project participants and to provide basic information on uses of ATI's funds and status of the project as its implementation is "played by ear." However, risks and delays that could have been avoided show that management information and control systems should have been developed before the project began.

h. Replicability

If ITCR develops the technology as expected, replication of the process for its development will aid in its refinement.[15] On the replicability of the prototype kiln, it will be within the technical skills of any mason/builder practically anywhere in the world. Replication should be responsibly promoted if it can be demonstrated that the kiln can be operated profitably. ATI has already allocated about $30,000 for activities that support replication.

i. Key inputs

The development of the new technology can be attributed to the prompt and favorable response of ATI to the ITCR request for assistance and to the dedication and excellent qualifications of the team of technicians assigned by ATI and ITCR to the implementation of the project.

C. ATI Links to Other Organizations in Costa Rica

1. Other donors - USAID

ATI operates in the country under the same bilateral agreement that covers the operations of AID for its implementation of the Foreign Assistance Act of the United States. However, there are no operational linkages with the AID Mission and communications are infrequent and limited to courtesy calls. The AID mission has expressed interest in learning about ATI's achievements.

2. Other organizations

No linkages have been established with other public or private organizations in the country, or with other multi-lateral development institutions. ATI feels that these are not necessary before the technology is demonstrated.

3. Funding

The provision of financial assistance by ATI was fundamental to the prompt start of the project. Ironically, if ITCR had chosen to

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[15]It is probable that additional work will be necessary to change the design of the support cone and fire chamber of the newly developed kiln to be able to burn coal instead of wood.

fund the project from Government sources,[16] the normal lengthy processing of these requests would have provided an opportunity to assess the risk of fuel shortage and of incurring a burdensome opportunity cost by not developing the appropriate technology to promptly exploit the market through the use of other available sources of energy. On sources of business loans, contacts and effective communications with the banking system would have revealed the existence of sufficient capital and could have enabled ATI to leverage its own resources from the outset.

CONAPROCAL's manager indicated that there will be sufficient risk capital from the banking system for the adoption of the technology, "if it proves to be as appropriate as expected." Therefore, he did not have any idea of how close the team was to meeting required performance specifications. Further, as ATI agrees, some $85,000 of the amount allocated by ATI to the project as loan funds will not be necessary.

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[16]ITCR Project Officer stated funding would have been available.

IV. WHEELCHAIR PROJECT

A. Overview

1. History of the wheelchair project

In 1981 ATI allocated US$ 107,059 towards developing a wheelchair appropriate to Third World environments (i.e., durable, lightweight, and collapsible) that could be produced in small machine shops. Mr. Ralf Hotchkiss, a mechanical engineer from Oakland, California, designed the wheelchair and trained practitioners at a workshop in Nicaragua in 1981. Production began but encountered problems due to raw material shortfalls caused by civil strife.

Several other training workshops were financed by ATI during the AID/ATI Grant period prior to October 1983. Several participants trained under these early workshops established their own wheelchair production enterprises. Five of these enterprises (2 in Bolivia, 1 in Paraguay, 1 in Mexico and 1 in the Philippines) are reported to be successfully manufacturing and selling the ATI/Hotchkiss wheelchair in their countries, without subsidy or further assistance from ATI. This project is said to be significant in ATI operations because it is the first attempt to disseminate an appropriate technology on a hemispheric scale. Other significant aspects of the regional project include:

- The vesting of the project with ATI as the project holder;
- ATI's long-term commitment to a single contractor;
- The enormous need and potential demand for the product; and
- The potential for replicating the technology on a world-wide basis.

2. Overall description of regional wheelchair project

The current regional wheelchair project is a result of ATI's decision to sponsor regional development and dissemination of the Hotchkiss/ATI wheelchair in Latin America. Table 10 gives a summary of the regional project. The major components of the project include a technical assistance contract with Ralf Hotchkiss, subproject grants to implementing organizations in Guatemala, Honduras, Colombia and Peru, and assistance to a wheelchair production enterprise in the Dominican Republic (see Tables 11 through 13 for basic data on these components of the project). Entrepreneurs from the Dominican Republic and Brazil who do not receive financial assistance from ATI under this project were receiving training in wheelchair production in Oakland, California from Ralf Hotchkiss at the time of the Evaluation Team's visit. The two unaffiliated enterprises in Brazil and the Dominican Republic entered the Project roll in November 1985 upon completion of training.

Table 10: Wheelchair Production (LAC Region) Project Summary

Region: Latin America/Caribbean	Project No.: 84-0631
Countries:	Peru, Colombia, Guatemala, Honduras and Dominican Republic
Name of Project:	Wheelchair Production (LAC Region)
Implementing Organization (IO):	Various
Productive Activity:	Wheelchair Production
Starting Date of Project Components:	December 24, 1984
Number of Months Elapsed at Time of Evaluation:	23
Scheduled End of Project Date:	June 30, 1987
Total Funding:	$300,000
Purpose of Project:	To assist small-scale enterprises in Peru, Colombia, Guatemala, Honduras, and the Dominican Republic to produce and market the ATI Hotchkiss Wheelchair.
Description of Technologies:	The Hotchkiss design developed under an earlier ATI grant and subsequently field-tested in several Latin American countries, results in a very light, durable, folding wheelchair that is well balanced and adaptable to individual fittings. The wheelchair can be manufactured locally at less than the cost of imported wheelchairs.
Previous Grant:	$107,000 to Ralf Hotchkiss to develop the wheelchair.

Table 11 : Funds Obligated and Disbursed by ATI Under The Wheelchair Production Project (As of October 31, 1985)

Subproject No. and Grantee		Funds Obligated	Funds Disbursed
A. Grant projects			
81-23	ORD/Nicaragua	$107,059	$107,059
83-15	Wheelchair Workshops	$126,200	$124,113
B. Cooperative agreement projects			
84-0631-1	Hotchkiss	$127,800	$42,059
84-0631-2	Sepas/Peru	$78,000	$26,875
84-0631-3	FES/Colombia	$80,000	$22,900
84-0631-4	Fuhril/Honduras	$9,000	$6,300
84-0631-5	CERVOC/Guatemala	$6,000	$4,000

Source: ATI

Table 12: The Wheelchair Project - Honduras Project Summary

Region: Latin America/Caribbean	Project No.: 84-0631-4
Country:	Honduras
Location of Project:	Tegucigalpa
Name of Project:	Wheelchair Production
Implementing Organization (IO):	FUHRIL
Productive Activity:	Setting up shop.
Starting Date of Project:	October 31, 1985
Number of Months Elapsed at Time of Evaluation:	4 months
Scheduled End of Project Date:	December 31, 1986
Total Funding:	$9,000
Purpose of Project:	See overall project description.
Description of Technologies:	See overall project description.

Table 13: The Wheelchair Project - Guatemala Project Summary

Region: Latin America/Caribbean Project No.: 84-0631-5

Country:	Guatemala
Location of Project:	Guatemala City
Name of Project:	Wheelchair Production
Implementing Organization (IO):	CERVOC
Productive Activity:	Setting up shop.
Starting Date of Project:	September 1, 1985
Number of Months Elapsed at Time of Evaluation:	4 months
Scheduled End of Project Date:	
Total Funding:	$6,000
Purpose of Project:	See overall project description.
Description of Technologies:	See overall project description.

After the first grant to develop the wheelchair, the regional wheelchair project was approved by ATI in December 1984, and the technical assistance contract with Ralf Hotchkiss was signed in January 1985. The ATI grants to the Honduran and Guatemalan implementing organizations (IOs) were signed in July 1985. The grants to the Peruvian and Colombian IOs were signed in February and June 1985 respectively.

The Evaluation Team visited the implementing organizations and their facilities in Honduras and Guatemala, the entrepreneur in the Dominican Republic who was to participate in the project, and Ralf Hotchkiss' workshop in Oakland, California. The Peru and Colombia subprojects were not reviewed.

B. The Technologies Involved in the Project

1. The wheelchair

This project includes: hard technology--chair design and systems for production; and soft technology--training, credit, and enterprise systems to facilitate replication. The basic design of the ATI/Hotchkiss wheelchair was developed and field-tested prior to October 1983, although modifications have been made since then to adapt to local conditions and availabilities of raw materials. These adaptations of the original design of the wheelchair continue to be made (as discussed in the country sections later in this report). The ATI/Hotchkiss wheelchair design results in a wheelchair that is lightweight yet durable, can be folded (for ease of transportation on buses, trucks, donkeys, etc.), and can be manufactured in simple workshops using materials that are available in-country, although some may be imported.

After training in welding, bending and other machine shop processes, the process of wheelchair construction starts with shop layout, production planning, and the procurement of parts and materials for a batch of chairs. For the side frames, cross-braces, footrests, and conduit pipes are cut and bent to specifications. Precision welding of formed parts is done with the help of jigs and basic tool kits that are supplied by the inventor of the chair (funded by ATI) to participating wheelchair enterprises (see Table 14: Project Outputs). These are sold or loaned with an option to buy.

After the side frames, footrests, front-wheel forks, and cross-braces are made, they are painted, chromed, or blued or browned to prevent rust. These components are then assembled, and the canvas seat is installed.

The hubs of the main wheels are made from heavier pipe. The ball bearings and spacer are inserted into the hub, the wheels are wired and balanced, the hand rim is attached with screws to the tire rim, and the tire is mounted on the rim. For attachment to the side frames, the axles are driven through the bearings and then secured with

Table 14: ATI Regional Wheelchair Project Outputs

Project Achievements	Scheduled December 1986	Achieved November 1985
Enterprises enrolled in the project	12	10
Enterprises producing the chairs	10	7
Capacity for annual production of chairs	2,500	1,450
Annual sales of chairs	2,000	N/A
Market Penetration	10%	N/A
Unit prices in US dollar equivalent	200-350	200-350
Basic tool kits distributed	12	10
Training workshops completed	1	4
Attendance workshops	8	14
Sales credit extended	$60,000	$13,000

Source: ATI Regional Wheelchair Production Project Status Report, October 1985

self-locking nuts to the special supports previously welded to the frames. The front caster wheels are formed and assembled in similar fashion (see Figure 2: ATI/Hotchkiss Wheelchair).

The wheelchair design was favorably reviewed by the Virginia (USA) Rehabilitation Engineering Center and was included in the project plan.

2. The dissemination and replication methodology

Under the earlier project, the various training workshops were the primary means of disseminating information on the ATI-Hotchkiss wheelchair design. Participants were trained in the techniques of wheelchair production. They were also given basic tools and equipment to help them set up in production. As explained earlier this led to spontaneous replication of the technology in five instances in four countries.

Information on wheelchair technology has been disseminated through four training workshops: Oakland in February 1985, Lima in March 1985, Tegucigalpa in September 1985 and Oakland in November 1985. In total, 13 people received training.

Most of the training is currently being done in Ralf Hotchkiss' workshop in Oakland, California. ATI expects that this training will also lead to replication of the project in countries not originally included in the project plan.

After its translation into Spanish, the wheelchair production manual, completed by Ralf Hotchkiss at the time of the Evaluation Team's visit in November 1985, will provide further information on the technology to interested individuals in Latin America.

C. Description and Findings about the Source of the Technology

1. Purpose and objective

The purpose of the technical assistance is to train local technicians and to develop the capacity to manufacture and market the wheelchair. Its objective is to introduce an improved wheelchair design which is more maneuverable and durable than imported models, inexpensive, and easy to produce in small metal shops using largely local materials.

2. Role of Hotchkiss

Mr. Ralf Hotchkiss has been contracted for a period of 18 months, beginning in January 1985, to provide training and assistance to the organizations and individuals participating in the project. His contract also includes funds for assistants who backstop training sessions; the fabrication, distribution and modification of the basic tool kits; generation and distribution of information; inventory

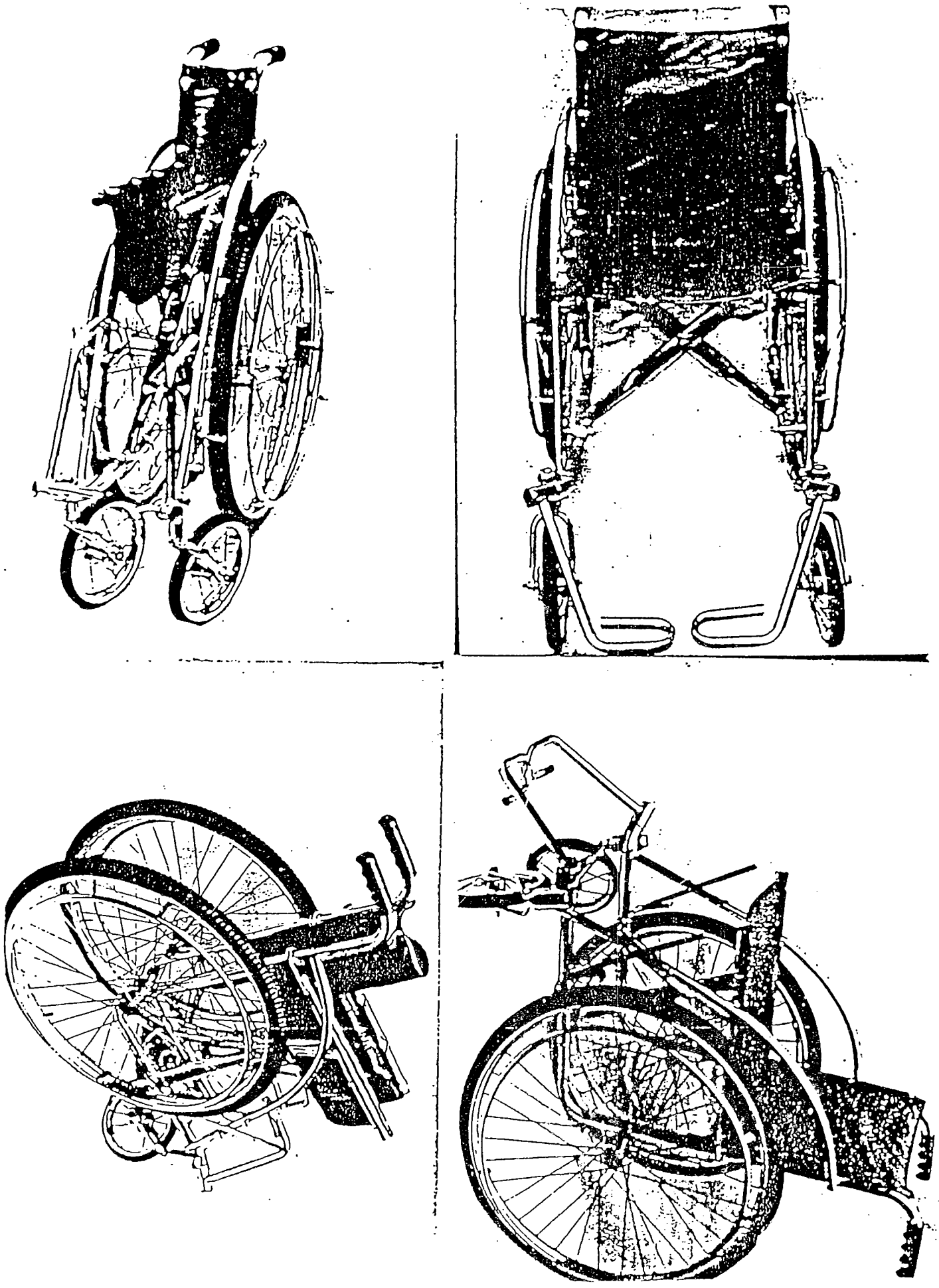

Figure 2: ATI/Hotchkiss Wheelchair[1]

[1] First commercially produced chair in Paraguay.

control; research; and travel expenses for in situ training. Total funding for this contract is $127,800.

When in the US, Mr. Hotchkiss conducts all work from his home. Although adequately equipped, his office and shop space are extremely limited. His work in the development of an overdue production manual has prevented him from satisfying reporting requirements stipulated by his contract with ATI. On the day of the Evaluation Team's visit, he completed the final draft, in English, and with the help of his wife and an assistant, was sending it to the printer. Also, with the help of another assistant, he was training three participants, one from Brazil and two from the Dominican Republic. All three were skilled mechanics. The Dominican producer was anxious to discuss several improvements he thought were necessary to produce the wheelchair in his country.

Under his ATI contract, Mr. Hotchkiss was given specific tasks and a daily fee. However, Mr. Hotchkiss had been unable to fulfill certain contract obligations. It was apparent that no consideration has been given to the optimal utilization of his time and skills. As it was, planning of his outputs was not based on consideration of time and effort requirements. In answer to a question about other activities and sources of income, he responded that he had provided some advice in a short consulting assignment.

3. Progress to plan

ATI informed the Evaluation Team that, under the leadership of Mr. Hotchkiss and the ATI Project Officer, a total of ten enterprises have been selected to participate in the project--three in Colombia, three in Peru, one in Dominican Republic, one in Honduras, one in Guatemala and one in Brazil. Basic tool kits have been distributed to these enterprises as of November 1985. (Table 15 summarizes overall progress under the contract for technical assistance.) Progress in each of the countries visited by the Evaluation Team will be discussed in Section D below.

D. The Countries Participating in the Project

1. Background

The grant agreements between ATI and the implementing organizations in Honduras and Guatemala were both signed in July 1985--six months after ATI signed the technical assistance agreement with Ralf Hotchkiss and only four months before the visit of the Evaluation Team. The Team visited Honduras, Guatemala and the

Table 15: Hotchkiss Performance Under the Contract

Work	Completed by 11th Month	Scheduled for Completion by 12th Month	Scheduled for Completion by 18th Month
Training workshops	4	1	1
Personnel trained	13	8	8
Enterprises visited	4	10	12
Days in the field:			
Hotchkiss	32	50	90
Assistants	20	50	70
Bulletins published	0	1	2
Production manual	0	1	2
Modification of basic tool kit	General	-	-
Component improvements	Few	-	-
Adaptations of design	Few	-	-

Source: ATI

Dominican Republic. Countries participating in the project, but not visited by the Evaluation Team, include Colombia and Peru.[1]

2. Honduras

a. History and description of implementing organization

Before the Cooperative Agreement ATI actively sought ideas and projects in Honduras. There were five projects in the country during the Grant period prior to October 1983. This wheelchair project is ATI's only involvement in Honduras under the Cooperative Agreement. The implementing organization, Foundation for the Rehabilitation of the Handicapped (FUHRIL), is an association representing 14 Honduran organizations involved in assisting the handicapped. It was legally set up in September 1984.

During interviews with the Director of FUHRIL it was learned that the Foundation was still being organized to function in pursuit of its own institutional objectives. The Project Officer shared the concerns of the Evaluation Team about FUHRIL's readiness to carry out the most basic administrative activities. Yet its director stated that they intend to undertake the training and production functions in combination.

b. Purpose and objective of the project in Honduras

The purpose of the project in Honduras is to provide on-the-job training to disabled workers and to set up a wheelchair production enterprise with a capacity to produce 300 wheelchairs annually.

c. Description of project and progress to plan

ATI will provide a total of $9,000 to FUHRIL during the project period, July 1985 to December 1986, for operating capital and local technical assistance. USAID/Honduras has agreed to provide up to $10,000 to purchase equipment and machinery for the wheelchair workshop. FUHRIL could not provide financial statements where any counterpart contribution or the potential financial benefits of the investment could be identified.

In November 1985, a shop was ostensibly in operation with six handicapped workers under the direction of two Peace Corps volunteers, as well as part-time assistance from a Honduran mechanic who had received direct training from Hotchkiss. This individual was slated to assist regional wheelchair manufacturing enterprises by passing to

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[1]The Honduras, Peru, Colombia and Guatemala subprojects are not considered "country projects" within the LAC program. According to ATI, they are elements in a regional project and their inclusion had nothing to do with specific strategies for ATI involvement in those countries.

other employees the knowledge acquired from Mr. Hotchkiss--shop layout and applied production techniques. However, the Evaluation Team noted that he had decided to enter a church ministry on a full-time basis.

The shop was being moved to a larger building; its layout had not been completed, and work had not yet been organized with any production goal in mind. Procurement of materials such as bearings, bolts, nuts, tubing, etc. had not been defined or organized. The workers were receiving a small stipend from FUHRIL to cover living expenses while the shop was organized, production was started, and people were interviewed for the position of shop manager.

There were no written plans for the development of the accounting system for the enterprise, for the procurement of parts and materials and inventory controls, for personnel policies, for marketing and distribution of wheelchairs, for training of personnel, or for distribution of profits (or losses). ATI asserts that it has in its files written plans prepared by FUHRIL for the procurement of parts and materials and estimates of costs per chair and cash flow estimates. It was learned, however, FUHRIL had only recently (October to November 1985) drawn up its own financial statements. These documents were not available for perusal by the Evaluation Team.

The Evaluation Team's examination of wheelchair parts that had been produced in Honduras showed serious imperfections. Ball bearing placement in the main wheels and in the front wooden wheels was not being done as instructed, tubes were not being bent correctly, and the rubber tire of the front wheel did not sit with sufficient tension on the wooden disk. There was no notion of quality control procedures, and nobody knew who would be liable for unacceptable performance of the wheelchair or for damage to property and harm to the rider in the event of mechanical or structural failures.

Overall, the status of the project in November 1985 did not show adequate progress toward achievement of the project purpose. ATI feels that "having a full complement of workers in a training mode four months after the subproject agreement was signed represents significant progress." The Evaluation Team strongly disagrees with this notion.

d. Commercial viability

There is no question about the demand for wheelchairs in Honduras. Based on a cursory assessment of the availability of parts and components and skilled laborers, it is conceivable that wheelchairs could be manufactured in relatively large quantities. FUHRIL had asked the Honduran Central Bank to perform a market analysis for the wheelchair project. Technicians at the Central Bank indicated that the project could be very productive. However, in November 1985, no written commercial analysis nor project proposal had been completed. The preliminary estimates of the wholesale prices of wheelchairs (imported and ATI/Hotchkiss versions) in Latin America as outlined in

the ATI Project Plan had not been revised to reflect current prices in Honduras.

e. Outputs/Impact

At best, the project is in the conceptualization phase. The Evaluation Team did not observe any significant outputs. Although one or two wheelchairs had been produced, they were initial "training" models of low quality.

f. ATI links to other organizations

Perhaps because it does not plan to operate other projects in the country, ATI has not developed meaningful operational linkages with other organizations. As noted earlier, USAID/Honduras has agreed to contribute equipment for the wheelchair workshop.

3. Guatemala

a. History and description of implementing organization

In 1978, prior to the Cooperative Agreement, ATI participated in a project with the Centro Meso-Americano de Technologia Apropiada (CEMAT). Some $300,000 were invested but the project reportedly was not successful. In a later project with HODE, a foundation for promotion and provision of low income housing to marginal groups, ATI was said to have been quite successful in the transfer of modular home construction technology. Housing, however, is not an allowed field under the Cooperative Agreement. ATI is currently monitoring the project but cannot expand it. The project was successfully replicated in Colombia by SERVIVIENDA.

For the wheelchair project, ATI selected the Centro de Rehabilitacion Vocational (CERVOC) as the implementing organization because the two mechanics they sponsored at the July 1984 Hotchkiss workshop qualified as excellent. Also, CERVOC reportedly promised to provide matching funds. CERVOC has been operating since 1978 and has set up training centers in woodworking, electronic equipment repair and textile weaving. These activities are carried out at its headquarters in Guatemala City, situated on the perimeter of a large city hospital. Products produced by handicapped workers in the textile workshop are being sold in foreign countries.

The Vice President of CERVOC, dominant figure in the wheelchair project, stated that CERVOC's Board of Directors had agreed to change the institutional emphasis from training and rehabilitation to job creation and productivity. She agreed that CERVOC now needed the services of an accountant and an expert in business administration.

b. Purpose of the project in Guatemala

The purpose of the project is to establish and maintain a wheelchair manufacturing enterprise to produce and promote the sale of 150 ATI-Hotchkiss wheelchairs in Guatemala annually.

c. Description of project and progress to plan

ATI allocated $6,000 to capitalize the wheelchair workshop and set up its productive capacity. CERVOC could not provide financial statements where any counterpart contribution or the potential financial benefits of the total investment could be identified. (ATI confirms there are no counterpart contributions at this time.) As of November 1985, the project in Guatemala was not yet in operation although the implementation schedule called for production of six wheelchairs by October 1985.

Although the workshop space for the wheelchair production facility has been designated, the building is constructed of highly flammable materials. The Evaluation Team pointed this out to the Vice President of CERVOC and her assistant, stressing that the production of wheelchairs involves intense welding activity by handicapped persons. They responded that they were going to have a fire extinguisher ready.[2]

The two handicapped technicians selected for the project were trained by Ralf Hotchkiss. Both showed excellent knowledge of the technology and offered suggestions for improving the wooden wheel, which they had found inadequate for their chairs. For the operation of the shop, they suggested that a plan should be developed and sufficient autonomy be allowed to facilitate the procurement of vital parts (such as ball bearings, bolts and tubing). As they have become more scarce and expensive due to recent Quetzal devaluations, procurement activity should be more dynamic to anticipate changes and take advantage of fewer opportunities.

While both technicians have been waiting for the wheelchair project to begin in Guatemala for over a year, CERVOC signed its agreement with ATI in July 1985. During this period, they have suffered great personal hardship because they could not commit themselves to longer-term alternative employment opportunities. At the time of the Evaluation Team's visit, in November 1985, they had been working at the shop for two months without salary, and no salary levels had been established. It is CERVOC's policy to pay workers on a piecework basis after items have been produced; by November 1985, no wheelchair had been produced.

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[2]ATI queried the administrator of the subproject on this point and was told that "no one but no one in Guatemala welds indoors." Welding equipment is kept in the shop for security reasons.

d. Commercial viability

Although most of the comments made by the Vice President of CERVOC about the approach to the commercialization of the chairs made sense, she admitted that she had neither potential buyers nor a business plan, and that there were questions about the availability of parts and materials for continued manufacturing activity. Focusing on wheelchairs already in use, and on a less complicated activity, she agreed that there were hundreds of chairs in need of repair, and that the establishment of a repair shop was an attractive possibility. CERVOC had not revised the preliminary estimates of the wholesale prices of wheelchairs (both imported and ATI-Hotchkiss versions) to reflect current prices in Guatemala.

e. Outputs/Impact

This project is in the conceptualization stage. No significant outputs were observed by the Evaluation Team that would allow assessment of any positive impact. Specifically, although the shop is equipped, an inventory of parts is on hand and the workers have received training, production had not yet begun.

f. ATI links to other organizations

Perhaps, because ATI does not plan to operate in other projects in the country, ATI has not developed operating linkages with other organizations in Guatemala. ATI's contacts with USAID/Guatemala appear limited to courtesy calls. Due to a national holiday, the Evaluation Team was unable to meet anyone at USAID/Guatemala to discuss the project and brief the Mission on the Team's preliminary findings.

4. The Dominican Republic

a. History

ATI's previous history in the Dominican Republic, as well as its other current projects, are described in detail in Chapter II of this regional report.

b. Purpose of project

The purpose of the project in the Dominican Republic is to assist a local entrepreneur to manufacture the ATI-Hotchkiss wheelchair.

c. Description

ATI's original intent was to implement the wheelchair project in the Dominican Republic through PROAPE, a local micro-enterprise lending organization. The plan was modified when ATI learned that PROAPE had sufficient resources to finance a local wheelchair shop, and did not require ATI funding. Therefore, instead

of financing the costs of setting up a wheelchair workshop, ATI will cover total expenses for training the entrepreneur in Oakland, California and the costs of the basic tool kit. The entrepreneur will obtain credit locally to expand his shop and produce wheelchairs.

The project in the Dominican Republic is not yet in operation. The entrepreneur/shop owner and his son have just began the required training in wheelchair construction.

The shop owner has shown great imagination and ingenuity in the development of a method used in his shop to manufacture the cargo tricycle wheels. The Evaluation Team learned in Oakland that his technology was being adopted for the production of wheels for the wheelchairs.

d. Commercial viability

The project is in the formulation stage. PROAPE did not disclose the results of its assessment of the potential profitability of the project.

e. Inputs/Outputs

So far, only two persons have benefited in the Dominican Republic from the regional project. The shop owner and his son received the required training in Oakland during November 1985.

f. ATI links to other organizations

ATI has developed operational links with several organizations in the Dominican Republic (see Chapter II, Section C).

E. Analysis and Conclusions

This analysis and the conclusions are based on the Evaluation Team's direct observations in the field.[3]

1. The consultancy with the wheelchair designer, Hotchkiss

a. Source and ideas

Given the magnitude of the challenge accepted by ATI and Mr. Hotchkiss, the general setting in the Oakland facilities was incongruous. The arrangement made for the utilization of Mr. Hotchkiss does not recognize the unusual opportunity that exists for fully utilizing his talent, energy and experience. It was quite evident that

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[3]The team visited subprojects only in Guatemala and Honduras, and the activity in Dominican Republic. In ATI's view, the Peru and Colombia projects which have six enterprises are much more representative.

the Hotchkiss technology for the manufacture of the chair in the US was appropriate, transferable and adaptable to developing countries. However, the observed technical method of achieving the practical purpose of transferring and adopting the technology to diverse environmental settings had not been successful.

b. Capability

During the Team's visit to Oakland, Mr. Hotchkiss showed impressive familiarity with resistances and performance specifications of materials and components and a keen interest in comments and suggestions for the improvement of his wheelchair.

Although the manufacturing process appears relatively simple, the final appearance, balance, symmetry, and integrity of the wheelchair are of paramount importance. All the wheelchairs examined both in the field and in Mr. Hotchkiss' workshop showed irregularities and poor workmanship. The wooden wheel (made of three layers of plywood), a hard rubber tire and two common automotive ball bearings stand out as particularly poorly fabricated parts of the wheelchair. Each of these parts is currently under review for possible re-design.

c. Progress

Fundamental wheelchair design problems are still present, although months have passed since they were pointed out by technicians at the Rehabilitation Engineering Center of the University of Virginia. The wheel vibrates at high speeds, is vulnerable to water damage, and requires a specially manufactured tire that is difficult to obtain in many countries.

During the visit to the shop, the Evaluation Team discussed with Mr. Hotchkiss a sheet metal wheel made from galvanized roofing material and a hand-made tire made from discarded automobile tires. He found the concept viable and planned to produce the first experimental wheel incorporating these changes the following week.

The use of automobile alternator bearings also appears to the Evaluation Team to be inappropriate from the standpoints of cost and availability. Bicycle bearings would be more appropriate and would simplify both assembly and maintenance of main and front wheels. Because it takes time to learn and because it is easier to copy than to create, the Team suggested that inventories of finished parts and an assembled wheelchair be provided in the initial stages of project execution in each country so as to facilitate learning and sharpen the workers' skills. Mr. Hotchkiss and ATI received these suggestions with enthusiasm.

d. Commitment

During the Team's visit to Oakland, Mr. Hotchkiss spoke with conviction and insight about the development of solutions to

transportation problems experienced by handicapped persons caused by rough terrain, heavy traffic conditions, and adverse lighting and climatic circumstances. His evidently intense commitment to an unnecessarily timid project could result in a high opportunity cost to him and ATI. With proper assistance, Mr. Hotchkiss could provide the necessary inputs to transfer and adapt his wheelchair technology to the world.

e. Risk

Project implementation is being played "by ear." Conditions in Honduras and Guatemala and performance of Mr. Hotchkiss under his contract provide prima facie evidence that no risk assessment was made to establish the probability of "adverse results or financial loss."

f. Marketability

Clearly, there is a great need for the ATI/Hotchkiss wheelchair in Latin America. However, it is the marketability of the technology that bears a direct relationship to the profitability of manufacturing the wheelchairs. This profitability not yet been established in any of the countries visited and should be the focus of ATI's efforts. The Evaluation Team concluded that, with a more aggressive and enlightened approach on the part of ATI to the implementation and replication of wheelchair technology, Mr. Hotchkiss would be extremely successful in proving the profitability and marketing his technology in the US and the world.

g. Key inputs

ATI has provided the financial support, and Mr. Hotchkiss has tried to transfer his technology. The results of his efforts indicate that the chosen methodology to achieve project purpose and objective in Guatemala, Honduras and the Dominican Republic should have been reconsidered.

2. The subprojects in Honduras and Guatemala, and the activity in the Dominican Republic

a. Source and ideas

The regional wheelchair project was proposed by the ATI LAC region program and follows on the two projects prior to the Grant Agreement, which provided for the development and testing the wheelchair design. Its implementation is being conducted through two modalities. In two countries visited (Guatemala and Honduras), ATI is working through nonprofit rehabilitation institutes which are attempting to set up shops to manufacture the wheelchairs. In the Dominican Republic, ATI is working through an institution that provides credit and management training to private entrepreneurs operating metal shops. In Guatemala and Honduras, the methodology adopted for

achieving project purpose and objective has not been successful. In the Dominican Republic, the selection of Mr. Marte, who was referred by the local micro-enterprise lending program, PROAPE,[4] could be a good choice if he receives technical assistance in business administration and in plant layout and production planning.

b. Capability

The selection of FUHRIL in Honduras and CERVOC in Guatemala was made without adequate consideration of the basic features that should characterize implementing organizations, such as a desire to set up profitable operations, expertise in capital budgeting and financial management, and ability to plan for results. Since these organizations were to manage the productive enterprises that will manufacture the ATI/Hotchkiss wheelchair in their respective countries, the prospects for achieving commercial operations are low.

None of the persons interviewed identified financial facilities for the purchase of the wheelchairs (when produced) by end-users. Total demand for wheelchairs had been identified, but there was no information on available means to expand the effective demand, to include handicapped persons at the lowest income levels. This is particularly important in view of the incidence of unemployment among this group, particularly in Third World countries. The need for a thorough market analysis and marketing strategy was evident in all the countries visited.

In the Dominican Republic, Mr. Marte, the shop owner, is in the business of producing a vehicle, the cargo tricycle, that requires similar technology, but the shop that the Evaluation Team visited is not organized for efficient operations. He is interested and knowledgeable in the field of metal mechanics, and seems committed to a successful transfer and adaptation of the wheelchair technology. Lastly, he has a reputation in the community and access to institutional credit.

c. Progress

The project started on December 1, 1984; as of October 25, 1985, US$ 102,134 had been disbursed--34 percent of the total approved for the project. The project is 11 months into its 24-month implementation schedule; project completion is scheduled for December 31, 1986.

Project implementation in the countries visited was at a very preliminary stage of development. The project in Honduras needs immediate assistance to map the approach and establish profitable

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[4]PROAPE selected and sponsored the entrepreneur; however, the sponsor is not an ATI subproject holder.

operations.[5] In Guatemala, although the announced changes of CERVOC's institutional objective may someday lead to an institution in the design and implementation of a private sector-oriented Guatemalan wheelchair production facility, the project may die while CERVOC develops this capacity.[6] The project in the Dominican Republic has not even been formulated. However, Mr. Marte and his son have just completed the training course with Mr. Hotchkiss.

d. Commitment

The commitment of Mr. Marte was strong at the time of the Evaluation Team's visit. At CERVOC and FUHRIL, it was clear to the Evaluation Team that the directors and managers of the organizations, and their direct assistants, did not have a clear understanding of the fundamental purpose of their participation in the project. Although the individuals were familiar with the objectives stated in the Project Plan, no one had specified the fundamental details of their efforts to carry out the implementation and operation of their projects.

e. Risk

No risk assessment was carried out for any of the projects visited. If the potential effects of the limited technical capacity of FUHRIL and CERVOC had been summarily discussed, the operations would probably not have been approved. ATI's reaction to the Evaluation Team's comments reveals a lack of understanding of what is meant by risk assessment. ATI needs to review these concepts and to strengthen its risk management capacity.[7]

f. Marketability

No documented market analysis was prepared, nor had a marketing strategy been formulated for the projects visited. A marketing strategy should have included consideration of the market for both the production technology and the wheelchair that will be produced.

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[5]A new full-time shop manager is being recruited and was to have been sent to Oakland for training in mid-February.

[6]ATI reports that, subsequent to the Team's visit, three sizes of demonstration chairs were reportedly constructed and put on display for ordering purposes, and ten frames were assembled.

[7]In rebuttal to the draft regional report, ATI compares the level of risk of the enterprises by country of location to the amount of funding for each subproject, noting that the inverse relationship (the "high risk" projects in Honduras and Guatemala received 8 percent of the regional project funding) indicates ATI's appreciation of the risk element.

Marketing of the ATI-Hotchkiss wheelchair should be the easiest part of the project in any of the selected countries if its quality and reliability can be demonstrated. ATI should develop a check list ("soft technology"), detailing minimum requirements for market identification and assessment and for the formulation of a marketing strategy, for this and other projects in the LA/C region.

g. Information flows

The channels of communications that are open are adequate to maintain contacts among project participants as haphazard implementation is carried out. The situations found in the countries visited and in Oakland indicate that conditions and events that should have been anticipated were not. The project has failed to consider the utility of implementing a management information system aimed at increasing reliable operations and accountability under the stated plan.

h. Replicability

The design developed under an earlier ATI grant, and subsequently field-tested in several Latin American countries, results in a lightweight, durable, folding wheelchair that can be manufactured locally at less than the cost of imported wheelchairs.

While the replicability of the chair is therefore quite possible, and efforts to transfer the technology should continue, the approach and efforts made by ATI to implement the project in the countries visited should not be replicated.

In all the countries visited (Honduras, Guatemala and the Dominican Republic), there was ample liquidity in the banking system to support these wheelchair projects--if ATI can show that they are technically, economically and financially viable.

ANNEX 1

Statement of Work

ARTICLE III - STATEMENT OF WORK

A. Concerns and Issues to be Addressed

1. ATI's Performance Under the Cooperative Agreement

a. ATI's Organization and Strategy for Implementing the Cooperative Agreement

Does ATI's Long-Term Strategy present an adequate blueprint for both carrying out the Cooperative Agreement and for the evolution of ATI? Have ATI's portfolio of subprojects and supporting activities been effectively organized to carry out the objectives of the Cooperative Agreement and the Long-Term Strategy?

b. The Relationship of ATI's Subprojects to the Long-Term Strategy

Do the subprojects funded by ATI reflect an investment strategy and tactical decision-making within the organization and the implementing organizations that seeks to (1) achieve the objectives of the Cooperative Agreement and the Long-Term Strategy (2) show the commercial viability of for profit operations, (3) promote viable and sustained enterprise development, (4) maintain a balance between the technical and process aspects of technology transfer on the one hand, and the institutional and popular participation aspects, on the other, and (5) provide monitoring and evaluation of ongoing activities in order to adapt ATI's or the implementing organization's approach as required.

c. Preliminary Results of ATI's Subprojects

Are ATI's subprojects adequately designed to meet their objectives? Are ATI's subprojects making adequate progress towards their objectives? What has been the preliminary impact of ATI subprojects on intended beneficiaries?

d. Cooperative Agreement Performance Targets

Is ATI making adequate progress in achieving the Cooperative Agreement performance targets ?

2. Lessons of Broader Significance for the Technology Transfer Process and the Promotion of Small- and Medium-Scale Industry

a. Quality and Impact of Technical Assistance

Is ATI providing appropriate technical assistance to implementing organizations to enhance the impact of capital investments? Are implementing organizations providing technical assistance as well as credit? Has ATI developed a workable approach to the adaptation of the technologies used

in its subprojects? Does ATI's strategy and practice give adequate attention to the marketing of both products and innovations? Has ATI developed the capacity to manage the technical assistance required to make subprojects successful?

b. Effectiveness of Implementing Organizations

Is ATI's use of cooperating country NGOs as intermediaries in the transfer of technology effective? Is ATI's use of cooperating country NGOs to administer venture capital funds likely to be successful? How effective are cooperatives and community development organizations in organizing and managing profit-making enterprises? Is this a way to reach the poor and isolated locations with profit-making enterprises? Are ATI's project partners manifesting the characteristics which are likely to bring about success in implementing the ATI program? Have they sufficient resources to carry out their ATI funded program? Is the staff capable of planning, managing and assisting enterprises which are striving for commercial viability, sustained technological growth, and adaptability to changing markets, opportunities, and constraints? Is ATI technical assistance adequately designed to fill the gaps?

c. The Supported Enterprises and Technology Transfer

What are the basic financial and economic parameters of the firms ATI supports to develop and market new technologies, products and services? What are the management capabilities within the firms and what types of technical assistance are available and have been provided from all sources? Is the technology likely to be commercially viable in this economic setting, in the time frame of ATI involvement?

3. Looking Forward - Replication of the Innovation Elements of ATI's Successful Appropriate Technology Demonstration Subprojects

- Replication of the Innovative Elements of ATI's Successful Appropriate Technology Demonstration Subprojects.
Is ATI's Replication Strategy Addendum workable and likely to achieve its objectives? Is ATI's current organization portfolio consistent with this Strategy? If not, what changes need to be made? Is the research design for ATI's replication research activity sufficient to obtain meaningful results?

ANNEX 2

LA/C: List of Persons Contacted

ANNEX 2

List of Persons Contacted

A. Costa Rica

Francisco Pacheco	Project Coordinator, ITCR
Elias Rosales	Civil Engineer, ITCR
Roger Solano	Heat Transfer Engineer, advisor to ITCR and project
Juan Bautista Monge Munos	Manager, CONAPROCAL, Patarra
Antonio Arce	Rural Sociologist, consultant to project
Luis Fernando Sabe	Forester, ITCR
David Kitson	Rural Development Officer, USAID
Ann Ferrar	Evaluation Officer, USAID
	Economic Officer, US Embassy
Roberto Villalobos	Rector, ITCR

B. Honduras

Yolanda de Cuello	Director, FUHRIL
Mike Magee	Technical Advisor, FUHRIL and Peace Corps volunteer
Robert Tapia	Advisor to wheelchair workshop and Peace Corps volunteer
Manuel De Jesus Ponce	Manager of wheelchair workshop

C. Guatemala

Erica Bornholt	Vice President, CERVOC
Silvia Del Cid	Social Worker, CERVOC
Carlos Gonzales	Wheelchair Mechanic, CERVOC
Marco Bielman	Wheelchair Mechanic, CERVOC

D. Dominican Republic

Alfredo Mena	Deputy Director of CENIP and Technical Advisor to Project
Yokota Sosa	Director, CENIP
Vicente Guzman	Director, PROAPE
Emiliano Velasquez	President, COTUI Federation
Juan Martinez	Vice President, COTUI Federation
Pedro Mejia	Secretary, COTUI Federation
Domingo Rosal	Program Coordinator, CAFESA
Luis Alvarez	Food Distribution Coordinator, CAFESA
Pedro Azcona	Project Coordinator, CIMPA

D. Dominican Republic (continued)

Emilio Olivo	Private Agricultural Development Consultant formerly Director of National Devine Reproduction Program
Oswaldo Hernandes	Director, CIMPA
Padre Felix Azcarate	President of CAFESA
Julio Guillen	Executive Director, APEDI
Art Valdez	Agricultural Officer, USAID/Santo Domingo
John Roberts	Program Officer, USAID/Santo Domingo
Rafael Marte	Bicycle Manufacturer, Santiago and proposed Hotchkiss wheelchair manfacturer

E. Oakland, California

Ralf Hotchkiss	Wheelchair designer
Paul Silva	Hesperian Foundation

F. Others

ATI

Tom Corl	Manager, Evaluation and Technical Development Group
Ton de Wilde	Executive Director
Eric Hyman	Evaluation Economist
Mike Tiller	Director of Field Operations
John Guy Smith	LA/C Regional Director

AID/W - Science and Technology Bureau

Michael Farbman	Chief, Employment and Enterprise Development Division, Office of Rural and Institutional Development
Edward H. Smith, Jr.	Technical Manager, ATI Cooperative Agreement, Office of Rural and Institutional Development
Ruth Zagorin	Director, Human Resources Directorate

ANNEX 3

Itinerary

ANNEX 3

Latin America/Caribbean Regional Team Itinerary

Monday, November 4	Arrive San Jose, Costa Rica
Tuesday-Thursday November 5-7	Visit Lime Kiln Project in Cartago and Patarra, Costa Rica
Friday, November 8	Leave Costa Rica for Tegucigalpa, Honduras
	Visit Wheelchair Project in Tegucigalpa, Honduras
Sunday, November 10	Leave Honduras for Guatemala
Monday, November 11	Visit Wheelchair Project in Guatemala City
Tuesday, November 12	Travel from Guatemala to Santo Domingo, Dominican Republic
Wednesday, November 13	Travel to Santiago, Dominican Republic and visit to Swine Feed Project
Thursday-Friday November 14-15	Visit Swine Feed Project in Santiago Area, Dominican Republic and also visit to Workshop that will participate in Wheelchair Project
Saturday, November 16	Return to Santo Domingo
Monday, November 18	Visit USAID/Santo Domingo and other interviews
Tuesday, November 19	Travel to Oakland, California
Wednesday-Thursday November 20-21	Visit Hotchkiss Workshop, Oakland