596 0027
9205730
PN-ABC-456
ISN 54952

FINAL REPORT

EVALUATION OF ICAITI, FUELWOOD AND ALTERNATIVE ENERGY SOURCES PROJECT, AND REGIONAL INDUSTRIAL ENERGY EFFICIENCY PROJECT

IQC PDC-5730-I-00-6110-0 #2

Prepared for

USAID/ROCAP
Guatemala

Prepared by
deLucia and Associates, Inc.
5 Hastings Square
Cambridge, MA 02139

September, 1987

TABLE OF CONTENTS

Page

EXECUTIVE SUMMARY

Section I: INTRODUCTION. 1

Section II: CRITICAL FINDINGS AND RECOMMENDATIONS OF THE ICAITI REVIEW. 2

Section III: CRITICAL FINDINGS AND RECOMMENDATIONS OF THE PEEIR EVALUATION 3

Section IV: CRITICAL FINDINGS AND RECOMMENDATIONS OF THE FWAE EVALUATION. 4

Section V: OVERALL CONCLUSIONS, OPTIONS AND RECOMMENDATIONS. . . .7

5.1 Option Zero. 8
5.2 Option A 9
5.3 Option A*. 9
5.4 Option B 10

PART 1 INTRODUCTORY REMARKS

Section I: OBJECTIVES AND THE STRUCTURE OF THE REPORT. 1-1

Section II: THE TERMS OF REFERENCE. 1-2

Section III: ECONOMIC-ENERGY SITUATION AND TECHNOLOGY DEVELOPMENTS 1-5

3.1 The Situation of the Economy in the Isthmus. 1-5
3.2 Energy Situation in the Isthmus. 1-6
3.3 Technology Developments. 1-9
3.4 Energy Conservation Strategy 1-10

Section IV: GENERAL ANALYSIS OF ONGOING PROGRAMS. 1-11

4.1 PEEIR. 1-11
4.2 FWAE 1-12
4.3 ICAITI 1-13
4.4 SIECA. 1-13
4.5 Original Design Framework. 1-14

Section V: FUTURE DIRECTIONS 1-16

PART 2 EVALUATION OF THE FUELWOOD AND ALTERNATIVE ENERGY PROJECT

Section I: PROJECT DESIGN AND HISTORY. 1-1

1.1 Project Background 1-1
1.2 Programmed Project Accomplishments 1-3
1.3 Project Implementation Structure 1-5
1.4 Issues Related to Project Design 1-5

Section II: SERVICE IMPACTS AND POTENTIAL. 2-1

2.1 Introduction 2-1
2.2 Evaluation of Specific Technologies - Combustion Component .2-7

2.2.1 Bread Ovens 2-7
2.2.2 ICAITI Brick and Tile Kiln. 2-10
2.2.3 Lime Kiln 2-10
2.2.4 Charcoal Kilns. 2-11
2.2.5 Improved Fuelwood Salt Evaporator 2-12
2.2.6 Bagasse Fired Crude Sugar Evaporator. 2-12
2.2.7 Gasifier. 2-13
2.2.8 Low Cost Ceramic Stove Kiln 2-13

2.3 Evaluation of Specific Technologies - Cookstove Component. .2-13

2.3.1 Institutional Stove 2-13
2.3.2 Fuel Efficient Domestic Cookstoves. 2-14

2.4 Evaluation of Specific Technologies - Solar Component. . . .2-17

2.4.1 Solar Lumber Kiln 2-17
2.4.2 Solar Fish Preservation 2-17
2.4.3 Solar Agricultural Dryers 2-18
2.4.4 Solar Salt Evaporation. 2-18
2.4.5 Solar Hot Water 2-20

2.5 Evaluation of Specific Technologies - Biogas Component . . .2-20
2.6 Evaluation of Specific Technologies
- Other Technologies Component 2-21

2.6.1 Micro-Hydro 2-21
2.6.2 "Hybrid" Units. 2-21

2.7 Comparison of Inputs and Benefits of Project Components. . .2-22
2.8 External Factors 2-23
2.9 Summary of Specific Recommendations. 2-25

Section III: IMPLEMENTATION MECHANISMS AND COUNTERPART ORGANIZATIONS 3-1

3.1 Basic Roles of ICAITI and Counterpart Institutions 3-1
3.2 Counterpart Organizations, Their Characteristics and Effectiveness of the Relationship. 3-3
3.3 Possible Measures and Implications for Sustainability and Activity Continuation 3-13

Section IV: ADMINISTRATION AND MANAGEMENT 4-1

4.1 General Considerations 4-1
4.2 Project Management of Counterpart Relationship 4-3
4.3 1987 Project Execution 4-3
4.4 Basic Conclusions on Management. 4-5

Section V: TRANSITION TO POST-FWAE ACTIVITIES. 5-1

5.1 The Current Situation. 5-1
5.2 Near Term Actions for a Positive Transition. 5-1
5.3 New Project or Services Development Areas. 5-4

5.3.1 Informal Sector Support (AID - El Salvador) 5-5
5.3.2 Commercial "Urban" Stoves Projects (Guatemala, Honduras, El Salvador). 5-5
5.3.3 PTR/CDI Follow-on Projects. 5-6
5.3.4 Technical Assistance for Private Sector Programs (Honduras, El Salvador, and Guatemala). 5-6
5.3.5 Technical Assistance and Training for Peace Corps Programs in the Region (Guatemala, Honduras, Costa Rica, Dominican Republic, and Belize) 5-6

5.4 Cost Recovery and Self Sustainability for Fuelwood and Renewable Energy Activities 5-8

5.4.1 Need for Alternative Policies for Differing Classes of Beneficiaries. 5-8
5.4.2 Cost Recovery and/or Cost Sharing From Non-Beneficiaries. 5-9
5.4.3 The Need for Flexible and Innovative Pricing/Cost Recovery Policies. 5-9

5.5 Documentation Needs for FWAE Termination and Transition 5-10

Section VI: CONCLUSIONS AND RECOMMENDATIONS 6-1

6.1 Conclusions. 6-1
6.2 Recommendations. 6-5

PART 3 EVALUATION OF THE REGIONAL INDUSTRIAL ENERGY EFFICIENCY PROJECT

Section I: INTRODUCTION 2-1

Section II: ORIGINAL PROJECT DESIGN 2-1

2.1 Project Background 2-1
2.2 The Concept of Energy Conservation: PEEIR and Its Market . .2-7
2.3 Economic-Energy Efficiency Strategy. 2-8
2.4 Conclusions and Recommendations. 2-9

Section III: ADMINISTRATION AND MANAGEMENT STRATEGY. 3-1

3.1 Organizational Structure 3-1
3.2 Operation of the PEEIR 3-3
3.3 Development of Self-Sustainability 3-7

3.3.2 Situation of the PEEIR. 3-9
3.3.3 Cost-Recovery and Sustainability. 3-12
3.3.4 The Need for Stable Pricing Policies. 3-13
3.3.5 Need for Alternative Policies for Different Beneficiary Characteristics 3-14
3.3.6 The Need for Flexible and Innovative Pricing/Cost Recovery Policies. 3-14
3.3.7 Organizational Changes. 3-16
3.3.8 Energy Policy Component and ICAITI Strategy 3-18

3.4 Areas of External Cooperation. 3-19

3.4.1 Private Sector Energy Consultative Committees 3-19
3.4.2 Regional Integration. 3-20
3.4.3 Identification of Key Groups and Institutions 3-20
3.4.4 Dissemination of Publications 3-20

Section IV: THE IMPLEMENTATION OF PREVIOUS RECOMMENDATIONS. 4-1

4.1 Introduction and Major Recommendations 4-1
4.2 Project Management 4-2
4.3 Project Staffing 4-3
4.6 Training 4-3
4.7 Promotion. 4-4
4.8 Database 4-4
4.9 Financing and Policy Issues. 4-4
4.10 Project Impacts. 4-4

Section V: THE RESULTS AND THEIR IMPACTS 5-1

5.1 Impacts. 5-1
5.2 Private Sector Involvement 5-2
5.3 Outreach Efforts 5-2
5.4 Components' Cost Recovery. 5-4
5.5 Progress Reports Preparation and Dissemination 5-5
5.6 Environmental Impacts. 5-6
5.7 Conclusions. 5-7
5.8 Recommendations. 5-7

Section VI: PERFORMANCE OF SIECA. 6-1

6.1 Introduction 6-1
6.2 Original Project Design. 6-1
6.3 Component Implementation of the Department of Physical Integration. 6-1
6.4 The Results and Their Impacts. 6-4
6.5 Progress Reports 6-5

Section VII: ENDING OF THE PROJECT 7-1

7.1 General Strategies 7-1
7.2 Discussion of Possible Impacts of Phase-Out Options. 7-1
7.3 Discussion of Option A 7-2
7.4 Discussion of Option B 7-2
7.5 Termination of SIECA Participation 7-2
7.6 Closing-Out Actions. 7-3

Section VIII: RECOMMENDATIONS 8-1

PART 4 GENERAL EVALUATION OF ICAITI

Section I: THE DETERMINATION OF STRATEGY AND POLICIES. 1-1

1.1 A Reactive Operations Mode and Lack of Strategic Planning. .1-1
1.2 Inactive Governance. 1-1
1.3 The Need for a Transition Period 1-2
1.4 The Needed Strategic Plan for ICAITI 1-3
1.5 A Needed Market Analysis 1-4

Section II: MARKET ORIENTATION AND SELF-SUSTAINABILITY. 2-1

2.1 Characteristics of the Lack of Market Orientation. 2-1
2.2 Pricing and Cost Recovery Strategies 2-2

Section III: ADMINISTRATION AND MANAGEMENT 3-1

3.1 General Administrative and Management Issues 3-1

3.1.1 Present Structure 3-1
3.1.2 Administrative and Organizational Characteristics . .3-1
3.1.3 Organization Changes. 3-3
3.1.4 Consultants versus Staff and Related Incentive Matters 3-5
3.1.5 Institutional Overhead. 3-7

3.2 The Management and Integration of Delegations and Headquarters 3-8

3.2.1 Organization and Operations 3-9
3.2.2 Incentives and Compensation 3-11
3.2.3 Coordination and Feedback 3-12

Section IV: FUTURE STRATEGIES FOR ICAITI. 4-1

4.1 Research and Development 4-3
4.2 Feasibility and Commercialization of New Products. 4-4
4.3 Technical Services to Improve Productivity and Quality . . .4-5
4.4 Training Services. 4-6
4.5 Information Services 4-7
4.6 Coordination and Collaboration with Other Institutions . . .4-7
4.7 Definition of Key Areas for Technical Services 4-8
4.8 PEEIR Extension - Transitional Issues. 4-8
4.9 Continuation of FWAE-related Activities - Transitional Issues. 4-8
4.10 Capitalizing of Possible Donor Project Opportunities 4-10

Section V: SUMMARY OF RECOMMENDATIONS. 5-1

PART 5 SOME INTEGRATING OPTIONS

Section I: INTRODUCTION. 5-1

Section II: OPTION ZERO 5-2

2.1 Option Description 5-2
2.2 The Team's Recommendation Concerning Option Zero 5-2

Section III: OPTION A. 5-3

3.1 Option Description 5-3
3.2 Some Issues To Be Considered 5-3
3.3 The Team's Recommendation Concerning Option A. 5-4

Section IV: OPTION A* 5-4

4.1 Option Description 5-4
4.2 Some Issues To Be Considered 5-5
4.3 The Team's Recommendation Concerning Option A* 5-5

Section V: OPTION B. 5-5

5.1 Option Description 5-5
5.2 Some Issues To Be Considered 5-6
5.3 Team's Overall Recommendation. 5-7

Section VI: CONCLUSIONS 5-8

ANNEXES

Annex 1 . . . . . .A1.1

Annex 2 . . . . . .A2.1

TABLES

Table #	Title	Page
PART 1		
II-1.1	Activities Performed	1-3
II-1.2	Itemized Terms of Reference and its Corresponding Section of the Evaluation Report	1-4
PART 2		
II-1.1	Project Personnel and Outlays (In Man-Years and US$ Dollars X1000)	1-3a
II.1.2	Fuelwood Project Outputs Programmed and Completed	1-4
II.2.1	Units Built and in Use	2-2a
II.2.2	Project Inputs and Impacts	2-3a
II.2.3	Sustainability	2-5a
II.2.4	Summary: Comparison of Inputs and Benefits	2-22a
II-2.5	Central American Fuelwood Prices in 1980 & 1987 (US$/cubic meter)	2-23
II-2.6	Household Fuelwood Use (%)	2-24
II.3.1	Types of Possible Counterparts, with Examples from FWAE	3-5
II.3.2	FWAE Counterpart Institutions	3-6
I.3.3	Basic Counterpart Evaluation Items with Some Examples	3-14
II.5.1	Additional Potential Services - By Country	5-7a
PART 3		
III-3.1	Professional Personnel Distribution Among the Components of the PEEIR	3-5
III-3.2	ICAITI's Divisions Cost and Income Summary for 1986	3-8
III-3.3	Social Cost Component Breakdown Paid Over the Salaries at ICAITI's Quarters	3-8

TABLES (cont.)

Table #	Title	Page
III-3.4	Income From the PEEIR and FWAE Seminars	3-9
III-3.5	Income Distribution By Year and Country Derived From Energy Auditings	3-10
III-3.6	PEEIR Total Expenditures Actually Incurred by Year ($1000)	3-11
III-3.7	Ratio Between Income from Audits and Expenses Other than Direct Salaries and Equipments	3-11
III-3.8	Estimated Average Cost of Energy Audits in Distinct Countries of the Isthmus	3-12
PART 4		
IV-3.1	Divisions and Personnel and Operating Budget Breakdown of ICAITI	3-1a
IV-4.1	Evolution of ICAITI Expenditures	4-2
IV-4.2	Illustrative Menu of Possible Functional Areas For Technical Services	4-9
PART 5		
V-1.1	Some Possible Elements of Option A	5-4a
V-1.2	Final Summary Conclusion for ROCAP's Future Directions on PEEIR/ICAITI Activities	5-8

FIGURES

Figure #	Title	Page
PART 2		
II-3.1	The Extension Process	3-1a
PART 3		
III-3.1	Structure of the PEEIR	3-1a
PART 4		
IV-3.1	An Illustrative Example of a New Matrix Organization for ICAITI	3-4a

EVALUATION TEAM

Alan Poole, Team Leader
Russell J. deLucia
Roberto Hukai
Keith Kline
Frank Masson
Otto Samayoa

EXECUTIVE SUMMARY

I. INTRODUCTION

This section very briefly summarizes key aspects of a three part evaluation. The evaluation examined two projects financed by ROCAP and implemented by ICAITI: the Fuelwood and Alternative Energy Project (FWAF) and the Industrial Energy Efficiency Project (PEEIR). A third part the evaluation focused on the capabilities and organization of ICAITI both from the perspective of the implementation of these two projects and the perspective of the broader needs of the region's industrial sector. The evaluation was undertaken by a five person team during the period June to August 1987. The evaluation team reviewed numerous project documents and other relevant material. This review included information on both the overall economic conditions in the region and a particular examination of the energy and industrial sectors of the five countries of focus. In addition, the evaluation team undertook a series of complementary interviews. These interviews included the following:

- extensive interviews with ICAITI headquarters and field staff (both project and non project staff);
- representatives of direct beneficiaries (firms, cooperatives, etc.) of both projects;
- participants in the workshops, seminars and other training activities;
- members of the Chamber of Industries and other private sector representatives in each of the participating countries (except Panama); and
- government and USAID staff in all of the countries under the projects (except Panama).

The results of this evaluation are detailed in the main body of this report. In this executive summary only the most important issues, findings, conclusions and recommendations are presented.

II. CRITICAL FINDINGS AND RECOMMENDATIONS OF THE ICAITI REVIEW

ICAITI'S Board of Directors, which consists of the Ministers of Economy of the five countries, has not met specifically to focus on ICAITI matters in about eight years. The ministers, however, have eventually attended to and resolved particular matters that ICAITI has submitted individually and directly to each one. This relative inactivity weakens the political links to the member countries and provides no direct input on important strategic agenda setting. During the last years covered by the evaluated projects, ICAITI has done little forward-looking planning and agenda setting; up to a certain extent it has operated in a reactive mode, mainly in reaction to donor initiative, specially ROCAP's. The evaluation team thinks that this mode of operation must change and that ICAITI should work actively with the member governments to set a clear agenda for the future.

ICAITI must, become more market oriented, the failure of which is one of the Institute's most serious shortcomings. But such changes, along with other needed reforms, cannot happen immediately; special efforts and studies to understand the market and set the Institute's agenda will be needed. Market analysis is also necessary to better take advantage of the technical capabilities developed in the FWAE and PEEIR projects. Outside help will be needed for these efforts. The evaluation team envisions a transition period of at least four years and non-project type support to assist with this transition. Hence the teams recommendation of Option B, outlined below.

The transition must also include administrative and organizational reforms. Possible structural realignment of ICAITI's divisions is suggested, as is the creation of a Business Development Division, the development of administrative norms and standards and staff training, particularly for project management. A major focus of administrative change must be to increase the responsibility and authority of the Delegations. The Delegations are close to the marketplace and their role will be critical to ICAITI's transition to a more self-sustaining institution. Also of importance will be a matrix-type management system better adopted to the functional and project aspects of activities within ICAITI.

During the transition, ICAITI must identify the priority market areas for it to move into. The evaluation team identified numerous opportunities of technical assistance demands in the region. Many are outlined in Part 4 of this report. But ICAITI cannot do everything at once. It must better understand it's capabilities and set priorities of areas in which to move, based both on existing staff capabilities and changes as need be. Part of the needed changes are personnel overhead (charge) policies, including mechanisms to use non permanent as well as permanent staff to meet the needs of the region which fit its Institutional priorities. These changes and reforms will aid

ICAITI to meet many of the region's needs. The Institute warrants ROCAP's support for this transition. It must be acknowledged that ICAITI's present management has already initiated the preliminary steps which are prerequisite to the recommended reforms. ICAITI is contracting an outside consulting firm to evaluate personnel responsibilities and salary structures, for example.

III. CRITICAL FINDINGS AND RECOMMENDATIONS OF THE PEEIR EVALUATIONS

The PEEIR project has been implemented with a high degree of competence and has earned ICAITI a much higher and positive profile amongst the industrial community in the region. This profile gives ICAITI an opportunity to tap other existing markets, but it has yet to capitalize on these opportunities, in part because of the lack of market orientation mentioned above.

The audit and other activities under PEEIR are now part of a mature set of activities delivered with a high degree of professionalism, achieved without an organizational structure well matched to the needs of such projects. A logical extension of the current audit services is to a more broadly defined process audit that will examine, in addition to energy, other materials and process issues. Such services are needed by industry. But the marketing and management of such services will require a reformed management system and staff training in project management, both of which are mentioned above.

The goals articulated for the PEEIR Project were in the form of numerical targets (of audits completed, numbers of seminar attendees, etc.). Aside from follow-up, these goals, even in their ROCAP approved revised form, have been largely met. The short fall in follow-up, however, points out a critical failing associated with the use of these numerical goals. Had more relevant goals been employed, such as the actual energy saved as a result of PEEIR activities, more follow-up would have been necessary. The failure of both ROCAP and ICAITI to revise the operational goals for the project is indicative of broader problems involving: project design and the systematic inhibitions which deter later modifications, institutional relationships, and abilities for self-analysis, which lead to the reactive operational style alluded to above. At the same time, previous evaluations have not been given enough serious review and follow-up, and the present evaluation team finds that many of their recommendations are still worth endorsing.

Both the evaluation team's surveys and another survey effort have verified significant impacts from project activities. Most firms have implemented many of the energy saving opportunities (OCEs) identified in the audits. However, there was also significant impact from the seminars and other training efforts. And since these recovered a

greater portion of their costs and were overall less costly, these training components were more cost-effective. Partially this is a result of the poor cost recovery in the audit program, which in turn was the result of an inadequately planned pricing policy.

Overall, the project has been very cost-effective. The team estimates conservatively that the minimum annual savings from energy conservation measures implemented to date as a result of project activities is more that US $2 million. This is roughly two-thirds of total project expenditures. Since investments in implementation were small, the return is already very satisfactory and should improve as industries continue implementing past audit recommendations. Higher ICAITI estimates of annual savings are plausible, but being available only at the end of the evaluation, could not be analyzed.

The policy issues regarding financing and pricing were largely the responsibility of SIECA. Although SIECA prepared numerous reports, as of today, none of the effort led to policy changes or even serious consideration of necessary changes in the policy development process in the countries of the region. Policy issues remain important. Under a project extension, other mechanisms must be sought to treat these issues.

PEEIR has been successful and presents ICAITI with a workable mechanism to begin the transition to delivering other technical services. PEEIR, through a modified extension, also presents ROCAP with an immediate, perhaps unique, opportunity to support the process of necessary transitional changes outlined in this report. These (changes or their absence) will be principal factors in the determination of ICAITI's future as an effective regional institution. In addition, PEEIR has been very beneficial in helping both institutions - ICAITI and ROCAP - focus on the potential which exists for the future and on the transition which is necessary to realize that potential.

IV. CRITICAL FINDINGS AND RECOMMENDATIONS OF THE FWAE EVALUATION

In comparison with other AID projects of this nature world-wide, the FWAE has been successful. The project with ICAITI met or exceeded the programmed outputs according to the original project design and its 1985 amendment, at less than programmed cost. The evaluation team believes, however, that serious flaws existed both in the original project design and in the 1985 amendment. There was a lack of market orientation and inadequate understanding of the extension process necessary for the introduction of new technologies. No significant attempts to correct these flaws in project design were made by ICAITI or ROCAP.

The FWAE Project has been relatively successful in fulfilling its basic objective to introduce new technologies, some of which have attained market acceptance and have immediate potential for self-sustainability. These have been the primary successes of the Fuelwood Project and include: lumber kilns, solar salt technologies, brick kiln (PTR adaptation), batch bread oven, ceramic stoves, modified Brazilian charcoal kilns, domestic (Lorena type) and institutional stoves. These technologies are responsible for almost all of the positive impacts of the project which include:

- 13,000 beneficiary households;
- over 400 small industries directly stimulated or established with over 1,500 people employed; and
- roughly 200,000 cubic meters of fuelwood conserved, primarily in critical deforested areas due to large contribution of solar salt.

Despite the noteworthy successes of this project, the evaluation team feels that FWAE has not attained the range and magnitude of impact for which potential exists. Due primarily to the flaws in project design, inadequate counterparts and lack of market orientation, the long-term continuity of many of the technologies is in jeopardy. The experiences of FWAE confirm wider international experience: that, in order to achieve it's potential impact, a project of this nature requires its organization, management and personnel to be strongly market oriented and respect some basic principles for introducing new technologies in the market place.

Potential exists for follow-on activities expanding from the specific technologies developed as well as the counterpart institutional experience gained. ICAITI has recently begun to explore these possibilities. Major examples include: informal sector support projects, commercial "urban" stoves projects, PTR/CDI follow-on projects, technical assistance for "private sector" programs targeted towards small businesses, technical assistance for lumber kilns, and other assorted small projects and services where demand exists among many FWAE counterparts. The accumulated experience and contacts with more than a hundred counterpart organizations represents an important institutional legacy of the FWAE project. The fact that ICAITI was able to work with so many different institutions at once, many of which were not able to coordinate effectively on other national programs reflects one of ICAITI's advantages as a regional institution.

Recommendations for the Fuelwood Project are oriented towards the problems related to the transition to sustainable post-FWAE project activities. They include the following:

- Management must be immediately improved. A business plan must be developed that identifies priorities and concentrates scarce resources on them. Clear responsibilities and indicators of progress must be established and regularly supervised and reviewed to make adjustments. Systems must be developed for project identification and review while proposal preparation must be streamlined. A clear sense of direction must be provided, something which has been lacking until now. Personnel should be re-organized into functional groups around highest priority activities in documentation (for 1987 only), promotion and sales of smaller services (including training), overall market analysis, and new project development. Resource allocation in terms of technologies should be reorganized to concentrate on consolidating successes.

- ICAITI must prepare to decentralize service delivery with greater reliance on national delegations, in response to emerging markets. Resources adequate for market development at delegate level must be provided. Pricing policies aiming for higher cost recovery on marketable services must be developed and delegations should have flexibility within guidelines. Policies on costing and overhead in general should be clarified, taking into account the need for multiple overheads relecting differing personnel categories and service delivery support costs.

- In addition to the above recommendations for ICAITI, the evaluation has led to the following specific recommendations for ROCAP. As part of Options A or B for the PEEIR extension (presentation of these options follows), at least a portion of the market development activities outlined above should be included within the business development/strategic planning activities whose funding within the extension has been previously recommended. These resources, even on a small scale, may be necessary to prevent the disintegration of the FWAE transition in an atmosphere of immediate crisis. ROCAP should give broker style support in assisting ICAITI to link with USAID and other donors for follow-on activities and new projects. Such support might be extended to sponsoring several thematic seminars in 1988 to re-enforce ICAITI marketing efforts.

V. OVERALL CONCLUSIONS, OPTIONS AND RECOMMENDATIONS

This evaluation team believes that ICAITI's mandate is as valid, or more valid, today than it was when the institute was founded. The two ROCAP projects evaluated were successful and have changed people's perceptions about ICAITI in a positive way. ICAITI has an enormous and important role to play in the region; ROCAP assistance could help ensure that ICAITI's resources are used in the best way to respond to the region's needs. Against a backdrop of real success, the evaluation report attempts to present constructive criticism for ICAITI's future and development. We are presenting many recommendations for change which could not only help ICAITI become more effective in responding to private sector needs but should also improve ICAITI's capacity for implementation of future donor projects and activities.

ICAITI has proved itself to be a competent provider of technical assistance delivered both as a result of numerous small testing and other requests and through the execution of larger projects such as those evaluated herein. Both the general technical competence and the capability to implement major donor financed projects are critical skills for the region. Because of the two projects, particularly the PEEIR, this competence is much more widely recognized by the industrialists of the region.

There exists a clear and continuing demand and need for the types of services, and their extensions, delivered by the two projects. In particular, a potential market identified for technical services is in more audits (and related technical services) to a broader range of industrial sector production processes, materials, and related problems. These demands are for proven cost-effective services. Users should be able to pay the largest part, if not always all, of the cost of these services, particularly if a more flexible pricing policy is evolved.

Technical assistance activities growing out of the FWAE represent real needs, but are not truly economic demands, given that many of the potential users lack the capacity to pay for such services. It is important to note that, as a result of the FWAE project, ICAITI has developed a valuable list of skills and expertise associated with the development problems of the informal sector. It is now equally important that the skills and expertise developed through both projects not be lost to the five countries.

ICAITI has successfully developed and improved its technical capability in the areas covered by the projects. However, it has not had commensurate development and change in many of the institutional and organizational areas that are needed. Some of these institutional issues have been touched upon in this executive summary. Others are discussed in detail in Part 4 of this report. The significant influence of ROCAP Projects in ICAITI over the past 10 years (with

ROCAP projects representing over half of the Institute's total budget) has had important impacts upon the institute as a whole. Thus, it is important to note that many of the shortcomings directly related to the ROCAP projects are failings for which ICAITI and ROCAP share responsibility. It is recommended that ROCAP do much more to assist and foster the institutional changes needed.

ICAITI faces a critical transition in its history. There is a clear need for significant institutional change. Yet this need for change occurs against the backdrop of a possible budgetary crisis. The two projects currently represent more than half the Institute's annual budget. The FWAE project is ending and continuation of PEEIR was one of the questions of this evaluation. And while ICAITI is pursuing other financing possibilities, no immediate project or support has been identified to replace these project monies and to undertake the needed changes. More than the typical project type monies are required. The evaluation team thinks special support for the needed transitional changes is much warranted. Following from the results of the evaluation a number of integrating options were considered regarding ROCAP's possible future support for ICAITI. These options are:

Option Zero, no extension of the PEEIR and hence it would end at the current Project Action Completion Date (PACD) of December 31, 1987.

Option A, extension of the PEEIR for two years, using already authorized funding and with modification of the project scope to facilitate some of the recommended changes.

Option A*, simple extension of the PEEIR for two years with no modification of the project scope.

Option B, Option A complemented by more resources (time and monies, core and/or other project support) in order to maximize the achievement of the changes recommended.

5.1 Option Zero

This option would essentially be an abandonment of ICAITI by ROCAP. Such action, or anything near it in implied budgetary support, would most likely precipitate a major crisis at ICAITI.

This option should not receive any serious consideration. The probable negative impacts of this option are detailed in the body of the report. A disintegration of ICAITI caused by budgetary problems would potentially extract a far higher cost to the region then solely the loss of the organization's capability. A loss of funding for ICAITI would inevitably lead to a dispersal of the skills and experience embodied in the organization's staff. Were this dispersal

simply directed toward other organization's doing similar work, the problem might be considered relatively minor. It is much more probable, however, that many of ICAITI's current staff would be forced to seek employment in positions unrelated to their present work, and access to the skills they have acquired through work at ICAITI would be lost (to the region) completely. Thus, 30 years of institutional development would be lost as well. Such a decision by ROCAP is viewed by the evaluation team as essentialy unfair on the part of AID.

5.2 Option A

This option would be an extension of PEEIR for two years. This would both continue existing project activities with a wider focus and assist in bringing about some of the needed broader changes. The extension would be done with modification of the project to permit activities not included in the current project description. Existing project components, namely the audits, would be expanded in their focus to allow the examination of process and quality assurance elements. Amongst the higher priority efforts recommended for institutional growth are strategic planning and market assessment studies and training of personnel in project management.

Based on rough estimates, as of the end of December 1987 there will be some US$ 1.6 million of authorized but unexpended funds available. This includes the US$ 900,000 which was part of the original project authorization, but which was has not yet been obligated. Finally, there is estimated to be some US$ 180,000 which has accrued from payment for audits. Nearly US$ 1.8 million is available for an extension. This amount can be compared with the recent annual expenditure rate for PEEIR which is about US$ 650,000.

This option should be chosen only if Option B below is not possible, or as a step towards Option B. The time and monies and type of commitment from ROCAP under this Option is insufficient to accomplish the necessary transition envisioned by the evaluation team.

5.3 Option A*

This Option is a limited version of Option A. No attempt would be made to deal with the necessary broader reforms that are needed but the PEEIR would continue to receive financing. This might be best characterized as the easiest way for ROCAP to delay the more difficult and painful decisions regarding project termination or modification. In the absence of commitment to support the broader reforms needed (Option A or B), Option A* would allow the now mature and reasonably well functioning PEEIR project to continue.

This option is not recommended. Even if there is little chance of future continuing support, any continuation of PEEIR should be done under Option A so as to give some support to the very critical process of institutional reform and change.

5.4 Option B

This Option, as introduced above, would include the support envisioned in Option A with additional resources of increased calendar time and monies. Option B basically seeks to assure the availability of resources to carry-out the necessary transition, to a complete and successful conclusion. This option would include support for a full four year transition period.

Very rough estimates indicated that the necessary funding for Option B could be significantly less than requested for the Productivity Project, especially in mid-1989. It is unclear whether this lesser call on resources might help to facilitate approval. While it is recommended that support of the necessary transition changes be given priority, this in no way should inhibit the development of new ROCAP-ICAITI projects, which might complement and take advantage of these changes.

ICAITI's Present Director (Acting) is very interested and open to improving the Institute's management and administration and to moving the Institute to a more market orientation. Now is an opportune time for ROCAP to tap this interest and motivation by supporting the needed changes.

Execution of Option B is the evaluation team's recommendation to ROCAP. Only this option will largely insure the required transition. It is noted that given programming constraints, it is easier to start with Option A. But initiation of Option A without a commitment to move to the additional time and money resources associated with Option B is not desirable. Such action limits ROCAP leverage and decreases the chance for greater successful use of the flexibility that can be built into a PEEIR extension.

PART 1
INTRODUCTORY REMARKS

PART 1
INTRODUCTORY REMARKS

I. OBJECTIVES AND THE STRUCTURE OF THE REPORT

The present evaluation report is concerned with two projects sponsored by the Regional Office for Central American Programs (ROCAP):

a. Fuelwood and Alternative Energy Sources (FWAE)

b. Regional Industrial Energy Efficiency Program (PEEIR)

The underlying theme of the FWAE Project has been to assist in ameliorating the critical problem of deforestation still occurring in Central America. The overall project goal is to improve welfare and productivity, and increase the supply of low-cost energy for low income groups. Its two major components are: (i) the identification of suitable alternative sources of energy and more efficient means to utilize fuelwood, the task to be conducted by ICAITI, and (ii) the development of improved supplies of fuelwood, the task given to CATIE.

The present evaluation report is concerned only with ICAITI's component of the FWAE Project, and this is to become its final evaluation since the project implementation period ends December, 1987 and will not be extended further.

The central goal of the PEEIR Project has been to reduce the balance of payment deficit of Central American countries. This objective is to be accomplished through improvements of energy efficiency in industry and the reduction of industrial consumption of imported petroleum by introducing energy audits, conservation measures, and energy efficient machinery. This Project has four components under the responsibility of ICAITI (industry program, training, promotion and field extension, and database and analysis), and one component being conducted by SIECA (financing and policy issues).

The Terms of Reference for this evaluation also include a general evaluation of ICAITI. This evaluation, interconnected with the completion of both projects (FWAE and PEEIR), should have a profound impact on the future of ICAITI. This general evaluation does not restrict itself solely to ICAITI's future energy porgrams. By expanding the evaluation's view to a broader perspective of the range of technical service areas possible to ICAITI, we are hoping the organization may be prompted to expand into areas that may in turn provide a wider base for successful self-sustainability.

The present evaluation of the two projects (FWAE, PEEIR) does not limit itself to the evaluation of the physical and administrative accomplishments achieved so far. Rather it also assesses the original design of the projects under the present economic/energy circumstances prevailing in Central America. This assessment of the very essence of

both projects was considered to be fundamental for making recommendations regarding the future of ROCAP's actions in the energy field, in general, and to any new projects either derived from the termination of on-going projects or designed independently.

Therefore, this evaluation report does not follow the usual path of the previous (FWAE, PEEIR and ICAITI) evaluations, but also touches the fundamentals of ROCAP's energy programs and tries to delineate their future in a more systematic way.

This report is divided into five parts: besides these Introductory Remarks, which make up Part 1, the other four parts deal with each of the evaluation subjects:

Part 2: Evaluation of the Fuelwood and Alternative Energy Sources Project;

Part 3: Evaluation of the Regional Industrial Energy Efficiency Project;

Part 4: General Evaluation of ICAITI; and

Part 5: Some Integrating Options.

Part 1 is concerned with the overview of the projects, the role of ICAITI, and the future directions. It also deals with the new circumstances derived from the fast changing energy technologies and experiences worldwide, which have direct influence on the future of both projects and of ROCAP's actions. The economic situation and its relation to the energy situation in the Isthmus is also examined in this section. Finally, recommendations are formulated as to the future directions for ROCAP's energy programs within this new context.

The evaluation involved very extensive and often intensive interviewing with ICAITI management and staff, beneficiaries, industry associaitons, government personnel, counterpart institutions, SIECA and AID in Costa Rica, El Salvador, Guatemala and Honduras (due to political turbulence Panama had to be excluded). Altogether more than 180 persons were interviewed, excluding a phone survey in Costa Rica of 52 beneficiaries. An ordered list of personal contacts is given in Annex 2. Table I-1.1 aggregates the interviews. The range and diversity of contacts was unusual for an evaluation and hopefully has contributed both realism and balance to the process.

II. THE TERMS OF REFERENCE

The terms of reference (TOR) for this evaluation are presented in Annex 1. These terms have been summarized into a list of items which are listed in the following Table I-1.2, followed by the corresponding section number of this report where these items of the TOR have been addressed.

TABLE I-1.1
ACTIVITIES PERFORMED

1. Repeated interviews with ICAITI management.

2. Interviews with all ICAITI national delegates, intensive in: Costa Rica, Honduras, El Salvador.

3. Interviews with industry associations in each country.

4. Interviews with industry beneficiaries.

Guatemala	11
Honduras	10
El Salvador	10
Costa Rica	7

5. Phone interview survey of secondary beneficiaries in Costa Rica:

FWAE	18
PEEIR	34

Interviews of Secondary beneficiaries in El Salvador - 5.

6. Interviews with government officials in Costa Rica, Honduras, El Salvador.

7. Interviews with AID staff in Costa Rica, El Salvador and Honduras; ROCAP.

8. Interviews with SIECA staff.

9. Interviews with FWAE counterparts (government and non-government) in all countries except Panama - 15 institutions.

10. Interviews with direct and indirect FWAE beneficiaries in all countries except Panama - over fifty.

Table 1-1.2: ITEMIZED TERMS OF REFERENCE AND ITS CORRESPONDING SECTION OF THE EVALUATION REPORT

TOR Item			Corresponding Section of Evaluation Report
I. Fuelwood Project (FWAE)			Part 2
A. Project experience and self-sustainability			
1	1 . 1	External factors	2.1 through 2.3; 3.2; 5.3
1	1 . 2	Favorable geographic areas	2.1 through 2.4; 5.3
2	1 . 3	Established institutional capacity	2.1 through 2.5; 3.3; 4.3; 5.1
3	1 . 4	Services addressing needs	2.1 through 2.5; 5.3
4	1 . 5	Services marketing merit	2.1 through 2.8; 9.3
5	1 . 6	Sources of revenues needed	3.3; 5.3; 5.4; 6.2
6	1 . 7	Increased service cost-effectiveness	2.7; 4.1; 4.2; 5.2
7	1 . 8	Mechanism for sustainability	3.1; 3.2; 6.1
8	1 . 9	Conditions for effectiveness of mechanism	3.1; 3.2; 3.3
9	1 .10	Establishing these conditions: ROCAP, ICAITI's role	4.2; 5.2; 5.5; 6.1; 6.2
10	1 .11	Timing for self-sustainability	Part 5
11	1 .12	Incentives for higher performance	3.1; 4.3; 6.1; Part 4
12	1 .13	Actions for the future	2.2 through 2.6; 2.8; 5.2; 5.3; 5.5; 6.2
13	1 .14	ICAITI's capacity for outreaching	3.1; 4.1; 4.2
B. Project development impact			
14	1 .15	Project performance to reach goals	2.1; 2.7
15	1 .16	Portion of target group reached	2.1
16	1 .17	Impact on counterpart organizations	3.2; 3.3
17	1 .18	Main benefits	2.1 through 2.7
18	1 .19	Impacts of documentation	5.5
19	1 .20	Management and its role	2.7; 4.1 through 4.4
20	1 .21	Promotional documentation	5.5
21	1 .22	Impact augmentation	5.1 through 5.5; 6.1; 6.2
II. Regional Industrial Energy Efficiency Project (PEEIR)			Part 3
1	2 . 1	Impacts to date	5.1; 5.2 through 5.4
2	2 . 2	Components cost effectiveness	5.4; 5.5; 5.7
3	2 . 3	Validity of original assumptions	2.3; 2.4
4	2 . 4	Outreach effort ability	3.1; 3.15; 5.3; 5.7
5	2 . 5	Project management	3.2; 3.3; 3.7; 3.15
6	2 . 6	Staff performance	3.4; 3.5; 3.6; 3.8; 3.15
7	2 . 7	Training and assistance	3.9; 3.11; 3.15
8	2 . 8	Development strategy for publications	3.10; 3.11; 3.15
9	2 . 9	Development strategy for sustainability	3.12; 3.15
10	2 .10	Reports evaluation	5.5
11	2 .11	Previous evaluations	4.1 through 4.10
12	2 .12	Operations performance	3.14; 3.15
13	2 .13	Environmental impacts	5.6; 5.7
14	2 .14	Evaluation of SIECA	2.3; 2.4
15	2 .15	End-of-project process	6.1; 6.3
16	2 .16	Project close-out recommendations	6.2; 6.3
III. Evaluation of ICAITI			Part 4
1	3 . 1	Measures to improve performance	1.1-1.3; 2.1-2.4; 5.1-5.4
2	3 . 2	Actions to improve cost-recovery	4.1-4.6; 5.1-5.4
3	3 . 3	Organizational modifications	2.1 through 2.4
4	3 . 4	Operations performance	2.1-2.4; 3.1-3.4
5	3 . 5	Relations with other organizations	2.2; 5.1
6	3 . 6	Sharing of experience	3.1; 3.4; 5.1; 5.3; 5.4
7	3 . 7	Proposal for new projects	5.2

III. ECONOMIC-ENERGY SITUATION AND TECHNOLOGY DEVELOPMENTS

3.1 The Situation of the Economy in the Isthmus

The present economic-energy reality was examined in order to reach conclusions regarding whether the assumptions on which the PEEIR project design was based remain valid, and what changes in project design are recommended according to the new state of the economy in Central America. The main conclusions are:

(1) Almost two thirds of the balance of payment deficit is due to the services account, which in particular accounted for an increase in the interest payments on the external debt. Oil and oil derivatives continue to be a significant factor in the balance of payments deficit. However, in the last two years, relative importance has been diminishing as a consequence of the reduction in the nominal value of oil imports due to a decrease in their unit value, and a simultaneous slow decrease in the quantum. Import price, of course, is the main factor responsible for the impact of petroleum imports in the balance of payments.

(2) Aggregate statistics suggest that there were no significant changes in oil and oil derivatives consumption per unit of output, referred to as energy conservation in the last 7 years, but there was a significant shift from oil to electricity.

(3) At the macroeconomic level, the extent to which the PEEIR and other government-sponsored energy conservation programs have reduced the demand for oil and its products is unknown. However, preliminary econometric results suggest that at least 89 per cent, or probably more, of the demand for oil in Central American can be attributed to price and the level of economic activity.

(4) A linear regression model was designed to explain variations in the volume of oil imports. It has been concluded that petroleum consumption by the transport sector is much more significant than other variables. The equation also indicates that geothermal production and hydroelectric production are also significant factors influencing variations in oil imports. Negative signs in the case of population, GDP and consumption by the industrial sector are consistent with the expectations of interfuel substitution in the economy, and appears to suggest that the link between oil and economic growth may have been weakened in Central America.

(5) Industrial sector analysis indicates that, during the period of rapid progress in economic development (1960 thru 1980) in

Central America, the energy intensity of production was falling while productivity was rising. An examination of the character of this change shows that the total utilization of electricity in industry almost doubled, while consumption of the other forms of energy, especially petroleum, was steady. The key feature was the impact of the change of the relative prices of electricity in relation to nonelectronic energy. Another important factor was the relationship between the size of the market and the amount of investment required for efficient operation derived from the implantation of the Central American Market.

(6) Over the period 1978-1985, energy intensity of industrial production was rising while productivity was falling. The conclusion is that the large drop in capacity utilization in manufacturing during the recession has in this way temporarily reduced energy efficiency. There are, however, indications that Central American economies are just recovering from a recession involving low capacity utilization.

(7) The most important conclusion of our economics analysis is that energy resource conservation in the industrial sector in Central America may be better attained through improving market allocation, rather than through regulations or sponsored energy conservation programs. However, there is wide agreement that the existence of net externalities creates market failures and suboptimal allocations of resources in the industrial sector. The presence of net externalities are not a sufficient justification for energy conservation interventions. The cost of corrections, including the cost of administration of the program, must be less than the cost of the net externality to be corrected. Failure to meet this test will lead to greater resource misallocation.

3.2 Energy Situation in the Isthmus

Since 1980 the petroleum consumption has dropped by about 20% but has been roughly level since 1982. From 1980 to 1985, the total cost of petroleum annual imports (crude and derivatives) have been pretty stable at around $ 1.05 billion (5% spread). Only in 1986 did this figure decrease by half, due to oil price counter-shock. The balance of payment also has stabilized at a negative rate of about $ 1.45 billion per year (10% variation) from 1982 to 1985.

The energy intensity indicators for the industrial sector (energy consumed per unit of value added) have shown a significant increase from 1980 onwards for the case of electricity and total energy, and it has remained practically the same for the case of petroleum in the same

period. It can be said, although with some hesitancy, that the economic-energy efficiency of the industrial sector has worsened a little (by around 15% in the last 5 years) in terms of electricity use, while maintaining the same for use of petroleum (probably due to the higher prices of this fuel).

Fuelwood

Evidence indicates that per capital fuelwood consumption has remained at about the same level since 1980, probably due to the relatively high total price (including price of stoves, etc.) of commercial fuel and electricity, which have retarded the shifting from fuelwood uses to commercial energy sources. This shift was occurring at a fast pace up until the middle 1970s. It is generally agreed that fuelwood ranks significantly behind commercial lumbering and land cleaning for grazing and farming among deforestation's causes in the rural areas. However, studies have also shown that the utilization of fuelwood in urban areas is indeed a significant factor of deforestation in areas close to population centers.

Fuelwood continues as the largest source of energy, by far, for residential uses in all the countries of the Isthmus. In Costa Rica, fuelwood satisfies 82% of total residential energy end-uses, while in Guatemala it represents close to 90%. As long as the transition to other fuels (such as LPG and electricity) is far from complete, fuelwood use will remain a major factor contributing to deforestation near urban areas. The transition period can be shortened, thereby relieving pressure on the region's remaining forests, if government incentives are provided for individuals to acquire electrical and/or gas stoves. A lack of investment money among the poor seems the determining factor in retarding the penetration of these stoves into urban areas despite evidence of rising prices for purchased fuelwood. These factors have important consequences for follow-on to the FWAE Project.

Electricity Generation

In the last five years, a drastic change has occurred in electricity generation. A program of rapid substitution from oil-fired power plants to hydroelectricity has prompted the maturation of large hydroelectric power plants, and the virtual elimination of the use of Bunker oil for thermal electric generation. Special cases for emergency or unusual dry seasons (such as occurred recently in El Salvador) required the use of thermoelectricity. Oil based electricity generation is also required in remote isolated areas outside the main electrical grids. Oil consumption to generate electricity has dropped from 937 million tons in 1977 to 172 million tons in 1986.

18

This large reduction primarily affected Bunker oil consumption, the primary derivative targeted by PEEIR, tending to exacerbate the problem of refinery balance.

The electric utility sector in the region generally suffers severe financial problems, with serious implications for the viability of planned capacity expansion to the year 2000, as has been observed by SIECA.

Petroleum Products Refinery Balance

On the petroleum derivatives front in the Central American Isthmus, it is important to notice that about 40% of the total petroleum derivatives consumption is of diesel oil as compared to 28.0% for gasoline and 21.0% for Bunker oil. Worldwide experiences in the last 10 years have shown that, from the technical-economical point of view, Bunker oil is the derivative most susceptible for substitution by other alternatives, e.g., natural gas, hydroelectricity, coal, wood and vegetable residues for steam and heat generation. Gasoline can be substituted by sugarcane ethanol, but with doubtful economy. Diesel substitutes are the hardest to find.

From the energy supply systems view point, it is necessary to examine the derivatives production structure of the Central American refineries. In fact, the present refining structure of the refineries does not match with the structure of the consuming market. For instance, in Costa Rica, while the present structure of consumption of the three major oil derivatives, i.e., gasoline, diesel, and Bunker oil, is 23%, 48% and 20%, respectively, the existing RECOPE's refinery produces 25.6%, 32.2% and 35.1% of the same products. Under these circumstances, if diesel consumption is to be matched, there will be a huge oversupply of Bunker oil available. On the other hand, the production of Bunker oil is to be matched with the demand, a large fraction of diesel consumption has to be imported.

Therefore, one can conclude that one major problem of fuel supply in the Central American Isthmus is that of the diesel oil. One available technical and economical solution is to add vacuum distillation and disasphaltization units in the existing refineries, drastically increasing the share of diesel production and correspondingly lowering the production of Bunker.

Sugarcane Bagasse

One underutilized source of energy in the Central American Isthmus is the bagasse from sugarcane. It is interesting to note that a very simple technology for drying bagasse to 20% moisture content (it is produced with 50% moisture content) has recently been developed and is starting to be used in Brazil. At this lower moisture content, the

bagasse has double the heat content of the alcohol derived in an alcohol distillery from the same original quantity of sugarcane. Therefore, because it can be surplus after use in the production of alcohol, the bagasse becomes a main energy form from alcohol distilleries.

Under this condition, during the 120 days of sugarcane harvesting per year the present production rate of sugarcane bagasse in the Isthmus represents about the same amount of energy in terms of heat as that of the daily consumption of petroleum. Sugercane bagasse may therefore represent the single most important renewable energy source readily available for under and more efficient uses (relative to its present utilization in the sugar mills).

3.3 Technology Developments

On the technological front, dramatic improvements of efficiencies have been achieved in the industrialized nations with respect to energy end-uses that have resulted in drastic energy savings in the USA, Europe and Japan. For instance, in the transportation sector, the best commercially available passenger cars for 4/5 passengers in Europe and Japan can make 25 km per liter of fuel under US-EPA driving conditions as compared to 4.5 km/l of average consumption index for the 3.6 million cars in Venezuela, and 8.5 km/l for the 13 million cars in Brazil. The average consumption index for the Central American fleet of passenger cars probably is between 6 and 8.5 km/l due to the large fraction of old and high power automobiles. The increase in car efficiency can drastically reduce petroleum consumption in the transportation sector.

Another example of dramatic improvement of energy efficiency is shown by refrigerators. For instance, while the average electrical consumption of the 17 million one door refrigerators in Brazil is 740 kWh per year, the most efficient refrigerator of the same capacity being sold in the industrialized nations consume about one third of electricity. Refrigerators represent 31% of residential consumption of electricity in Brazil and a similar figure in Costa Rica.

Several other examples of efficiency improvements can be cited: high efficiency air conditioners using rotary compressors consume about half the amount of electricity when compared to regular air conditioners using reciprocating compressors. High pressure sodium lamps consume six times less energy for the same level of illumination when compared to incandescent lamps still in use in many places in the Isthmus for street lighting.

These technological developments may have a profound influence on the future directions of ROCAP's energy programs in the Central American Isthmus, and by consequence, on the ICAITI's future and the PEEIR's. The transportation and commercial sector could become important items for policy implementation.

20

3.4 Energy Conservation Strategy

Experiences gathered from the energy conservation programs conducted elsewhere (by several developmental agencies and the World Bank), have shown that in order to assure a high degree of success, any energy conservation strategy must be treated as part of an economic strategy run by the government. The main goal of this economic-energy strategy should be to change the structure of the economy to a higher degree of efficiency. Therefore, an energy conservation plan, be it for fuelwood or industrial energy, has to be treated in a systematic way to be truly significant in energy savings.

Almost all industrialized nations were able to adjust themselves to the new energy situations resulting from the oil crises of 1973/1974 and 1979/1980. By improving significantly energy performance, the US economy is using one third less energy to produce the same unit of GDP today as compared to 1979. Almost all developing countries have had their energy performance worsened. This is due to the less dynamic character of the economy of developing nations. Therefore, in order to effectively improve the energy performance of the Isthmus countries in a significant way, it is essential that broad governmental policies be set in order to send correct signals to the market, so that the economy as a whole moves toward higher levels of energy efficiency. Otherwise, no devised punctual technical solutions can truly affect the energy performance in a significant way.

The governmental economic-energy strategy has to be designed to act simultaneously in several fronts:

- Energy pricing;
- Efficiency standards and regulations;
- Monetary and fiscal incentives;
- Industrial policy and import tariffs;
- Energy performance information and monitoring; and
- Institutional and legislative changes.

All these components have to work in a concerted way aiming always to achieve better energy efficiency. Isolated actions such as a price increase of fuels or electricity have shown to be politically very costly. The essence of the economic-energy efficiency strategy should be to realize structural changes in the economy.

Some specific examples of this economic-energy strategy that would deserve in-depth analysis are:

- A correct fuels pricing policy, together with monetary incentives, could quickly create the conditions to stimulate the shift from fuelwood to LPG stoves in the urban sites, thus lessening the problem of land deforestation in the vicinities of the cities. Gas utility companies could provide gas stoves for free, by charging correspondingly higher prices for the gas to amortize the upfront investments. However, an adequate industrial policy and the remaining policy components must be designed consistently to that aim.

- On one hand, this shift from fuelwood to LPG can improve the environmental conditions of the urban poor and their economic situation by cutting down transactional and financial costs for cooking, but it could worsen the economic situation of the rural poor who supply the fuelwood. Also there are national energy/economy implications of loading an additional 50-80% of population into LPG cooking - LPG is imported. Therefore, policy incentives are powerful instruments to realize changes in energy consumption and the economy, but they necessarily require a broad systemic view of the economy for correct implementation.

- A multi-component policy touching all the items aforementioned could stimulate an increase of motor vehicle fleet efficiency, dramatically reducing the need for fuel for transportation, presently responsible for almost half of the petroleum consumption in the Isthmus.

IV. GENERAL ANALYSIS OF ONGOING PROGRAMS

4.1 PEEIR

With the exception of the overall annual imports savings target of 182,000 tons of oil, the remaining numerical output targets of the PEEIR have been achieved at less than budgeted cost, with a high degree of competence. ICAITI's reputation within the industrial community is very good and reasonably well known. The potential savings identified by audits have been close to those originally targeted. The opportunities for energy conservation (OCEs) have emphasized minor plant modifications with low investments and rapid payback. Only recently has there been some move towards deeper audits involving process changes.

22

Although almost all audited industries have implemented more than 50% of the OCEs, larger investment OCEs probably will require some kind of extra incentives to motivate the industries to adopt them. The changes in service pricing policy have been clumsily handled and generic administrative problems of ICAITI have complicated the execution of PEEIR and the full utilization of the Delegates potential.

The SIECA's contribution to PEEIR has been almost negligible, and no single item on financing and policy issues derived from SIECA's work has been adopted to date by any country in the Isthmus.

The principal numeric targets for the PEEIR of 182,000 tons of oil (worth roughly $32 million) saved in 1987, and an 11% improvement in overall energy efficiency and $79 million of annual savings in petroleum imports by 1992, will certainly not be reached. Such goals are not realistic today since they assumed steady economic growth in the region and $35 per barrel for fuel (principally Bunker) saved. A 1987 target calibrated around today's Bunker fuel price and industrial activity would be closer to $8 million. A very conservative minimum estimate of savings achieved directly through level II audits is $2 million dollars per yer, with implementatin steadily increasing among previously audited firms. The real savings could well be substantially higher. For 1987, the original target of imports savings was set to be 182,000 tons of oil which at current fuel oil prices would be valued at $ 34.5 million. The best estimate of the savings achieved so far is calculated to be $ 5 million, but with very poor accuracy.

One of the most important components for greater improvement of PEEIR is the follow-up of the energy audits. This could become the entrance door into a wider market of general technical assistance to the Central American industries.

4.2 FWAE

The FWAE Project has also met or exceeded the formal numeric outputs and goals originally established, at less than budgeted cost, and has successfully established awareness of technologies in over 50 counterpart institutions and with many other potential users. The total beneficiaries were estimated to be 13,000. Over 400 small industries were directly stimulated and 1,500 people were employed.

Through this Project, ICAITI has established the best woodstove research laboratory and personnel in the region. Rural ceramic stoves are nearing commercial viability via cooperation with the private sector and several small industries adopted with success several of the FWAE derived technologies such as lumber kilns, solar salt, PTR brick kiln, batch bread oven and ceramic stoves. Valuable dissemination efforts of the technologies were conducted in all the countries of the Isthmus.

On the negative side of the FWAE Project, the evaluation team has detected an overwhelming emphasis on numeric output, a lack of market orientation and research, concentration on rural rather than urban areas where the fuelwood problem is more serious and market potential the highest. However, these shortcomings can largely be traced to the original project design. It also accounts in part for the lack of user's participation in design, testing, and evaluation process, and underestimation of the time required to perfecting and disseminating new technology.

Overall, the estimated total accumulated savings attributable to the FWAE Project is calculated to be 200,000 cubic meters of fuelwood. The present annual savings are estimated to be 90,000 cubic meters, equivalent to 2,250 hectares per year of potential deforestation.

4.3 ICAITI

ICAITI is a unique institution of research and development in the Isthmus, and its role as the technological supporting Institute for the Central American industries should be preserved.

Its main failure has been its inability to design a consistent institutional strategy and be more market oriented so as to better serve the region's needs and to pursue a path of lesser dependency on donor institutions.

In general, ICAITI has amassed considerable technical competence in various areas of importance to Central America. Its Delegations have taken root and, generally, have quality staff for functions necessary for a regional institution.

However, its administrative structure is inappropriate for a market oriented Institute, with no clear administrative norms and procedures established and approved at present. There are no clearly established rules on personnel evaluation and compensation. Its activities lack, almost totally, any market orientation.

4.4 SIECA

Although a profuse quantity of papers has been published by SIECA, some of which have been useful for this evaluation, there is no evidence of one single policy, measure, or financing scheme, developed by SIECA yet adopted by any country in the Isthmus. This component of the PEEIR was considered to be the weakest.

For any energy conservation program to succeed in achieving significant savings of energy, policy measures are of crucial importance. In an attempt to influence policy formulation, other mechanisms must also be sought, so that an examination of these related policy issues can be fruitful.

Two points should be raised to better understand the weak performance to date. The task of convincing state agencies to change such things as prices or financing can be very slow, especially since it is an advisory institution and does not have leverage. A couple of financing proposals for the Central Banks are now at least nearing implementation. Second, there is reason to believe that while funded by PEEIR, there were expectations that SIECA would use at least some of those resources to carry out wider energy analysis related to PEEIR, but closer to its main line of work. Thus for example, SIECA's work on energy prices is for all sectors and not only industry. While there was an unfortunate loss of focus on PEEIR issues, and an excessively descriptive nature to much of the work, at least the dissociation did not become complete - as occurred with the original CAITIE/ICAITI joint fuelwood project (the ICAITI FWAE project has been formally distinct from that of CATIE for some time).

4.5 Original Design Framework

Changed Boundary Conditions:

The original design framework for the PEEIR and to a lesser extent the FWAE projects were correctly structured for the economic-energy conditions prevailing 5 to 8 years ago.

However, since then, several of the prevailing boundary conditions have changed, leading to a need for adaptations to the new circumstances. Among the most important changes that have occurred in the last five years are:

a. More detailed data and information on the energy matrix of each of the Isthmus countries are available as a result of the experiences gathered by both projects along the years of operations. And of course the data bases at the ministries in some of the countries are now much improved.

b. ICAITI's reputation within the industrial community is more well established as a competent technical institution.

c. Today's petroleum supply market conditions present different characteristics than those of the time when FWAE and PEEIR were conceived. Regional oil refining structures are clearly different from the required demand structures. This imbalance has worsened. World oil prices are lower but the balance of payment impacts of imports remain high.

d. Experiences gathered from around the world on energy conservation planning and execution provide a solid background to reassess the validity of the original assumptions.

e. There have been significant improvements in energy and in technology as a result of research and applications efforts in many industialized countries over the period since the PEEIR project began. Hence the experiences gathered from the PEEIR and FWAE projects can now be combined with technological developments on improving the energy-using efficiency of end-use equipment gained elsewhere, to profoundly influence the future directions of ROCAP's energy programs in the Isthmus.

The principal changes proposed for the original design framework of the PEEIR and FWAE projects are:

1. FWAE

For many areas in the Isthmus, the main target market, the rural poor, is very difficult to reach due to the lack of adequate means of communication and low market density. In addition, fuelwood used in the rural areas is not critical to deforestation and land degradation. A better target would be the low income urban population which still uses fuelwood mainly for cooking. They are easier to be reached through the normal media and are highly concentrated, mostly in the periphery of urban centers. Most importantly, they pay high prices for fuelwood (up to 30% of income), creating a market incentive for conservation.

The original design framework put very little emphasis on policy studies ($25,000 for review of legislation and administration regulations) and restricted itself to examine the institutional factors which might retard wide use of project results. On the contrary, emphasis should have been put on the market factors which could stimulate the adoption of higher efficiency fuelwood burning equipment and energy substitutes.

Since this Project is approaching the end of its life, the evaluation team does not consider relevant any changes in the original design of the FWAE Project. However, its follow-on should be part of the general proposals for the reformulation of the PEEIR and ICAITI's future.

2. PEEIR

There are four basic items of the original design framework which deserve rethinking:

a. Two of the most important agro-industrial sectors in Central America, those of coffee and sugar industries, were initially left out.

b. In the original project design the structure of the petroleum refined products and its connection to sectorial markets has been neglected. Today it is clear that the main target fuel related to balance of payment deficit should have been the diesel oil. The fixed refining structure of the oil refineries create constraints which limit imports savings creating unbalances between production and consumption structures. Diesel oil together with gasoline are tightly connected with transportation. The target fuel of the PEEIR has been the Bunker oil, which is overavailable in the Caribbean Basin and the easiest to find alternative for substitution.

c. The policy study and financing component of the PEEIR should be reformulated in a more consistent way and given top priority, because consistent policies are a key to effective structural changes in the economy that could lead to significant and permanent increase of energy efficiency (not only in the industrial sector, but in all sectors of the economy). There is no mention of norms and efficiency standards of industrial products and equipment. The issue of energy pricing has not been given the emphasis it deserves, neither have the issues of fiscal incentives nor institutional factors. Worst of all, no mention was made of a methodology for the conduct of studies on energy efficiency. An overly strong emphasis on financing may have hindered the aforementioned equally important other factors.

d. Energy auditing has received the greatest attention, with the measuring criteria for success being the number of audits. An equal emphasis should be focused on follow-up technical assistance, and the efficiency criteria should be changed to a measure of actual energy savings accomplished. Energy auditing, in any case, has a limited market, with its effect restricted to better plant energy housekeeping.

V. FUTURE DIRECTIONS

As to the future of the PEEIR and the follow-on to the FWAE Project, they are strongly connected with the future of ICAITI itself. And this future could be strongly influenced by ROCAP's willingness to make a commitment to assist ICAITI in the task of improving its market orientation and thereby diversifying its sources of funding.

Therefore, there are three dimensions to the future directions for consideration:

a) The future of ROCAP's role in ICAITI.

b) Organizational changes at ICAITI.

c) The formulation of a new Institute strategy within ICAITI.

As for the future of ROCAP's role, there are basically four alternatives, which are presented in Part 5 of this report. The team's recommendation is for the adoption of what has been called Option B. This option would require continued support from ROCAP for a full transition period of four to five years and also require substantial involvement of ICAITI to perform basic changes within its present structure of operation.

This proposed involvement of ROCAP will be dependent upon the willingness of ICAITI to carry out in-depth changes of its own. Organizational changes are often difficult to realize and require a great deal of managerial effort, training, and staff's time, besides specialized management consultants to carefully advise on the timely and slow process of changes. Following the path adopted by the great majority of R&D institutions like ICAITI worldwide, it is recommended that a matrix mode of management be implemented at ICAITI within the four year transition period. Deeply ingrained cultural factors and many other factors such as the physical location of the present equipment, have to be taken into consideration in an in-depth study to perform the proposed organizational changes.

And, finally, the formulation of an Institute strategy and complementary market studies should be the third crucial component for the conclusion of the Option B. This strategy should basically be focused on the Central American market needs; that is to say, a dynamic process of continuous changes to best perform the role of technological gate-keeper and a center for supporting technical services and source of technological information for the Isthmus.

PART 2
EVALUATION OF THE FUELWOOD AND ALTERNATIVE ENERGY PROJECT

PART 2

EVALUATION OF THE FUELWOOD AND ALTERNATIVE ENERGY PROJECT

I. PROJECT DESIGN AND HISTORY

1.1 Project Background

In the late 1970s and early 80's the Agency for International Development initiated renewable energy projects in developing countries around the globe. The initiative was primarily the donor's - fall-out from the US energy crisis and the renewables movement that followed.

In Central America, a need certainly existed for solutions to the impending fuelwood shortages predicted by such international organizations as FAO. In fact, fuelwood prices were already on the rise due to scarcity in specific regions. AID determined that the problem was regional and that the most appropriate regional institutions to deal with the problem were ICAITI (for the energy technologies component) and CATIE (for the forestry components). This evaluation concerns itself only with the ICAITI component of the project.

ICAITI had already proven itself as a ready and willing collaborator in ROCAP programs. The Institute, by statute, can only accept donations with the approval of the Board of Directors, which is practically inoperational. Therefore, AID projects were considered and managed as contractual agreements.

Although ICAITI had not specialized in renewable energy technologies previously, and did not have a long-term plan which contemplated such a program, it was very enthusiastic about the prospect of participating in this new field.

In 1979, AID contracted ICAITI to do a preliminary study of fuelwood use in Central America (ROCAP Purchase Order 79-149). This study, based upon one month of field investigation in rural areas, was instrumental in defining the types of activities to be carried out by ICAITI under the Fuelwood and Alternative Energy Project.

The overall project goal is "to improve the welfare and productivity of low income groups and increase the supply of low-cost energy for rural and urban poor." The original project agreement dated September 12, 1979 defines the ICAITI portion of the Fuelwood and Alternative Energy Project as:

"a cooperative and coordinated effort by ICAITI... national research and other institutions in Central America and Panama... to test and provide new and improved energy efficient technologies for use

in rural homes and communities and by small and medium industry. This program will place special emphasis on the needs of the rural small farmer, rural families and small, primarily rural, industry."

Project purpose: "to develop, demonstrate and make available for transfer... efficient low-cost domestic, small community and small and medium industrial fuelwood and non-conventional energy technologies."

The Project description also detailed the types of technologies to be developed and the number of units to be demonstrated in each case. The Project Paper did not include any basic research in technology development; however, evaluation, modification, and transfer of existing technologies now in use in Central America or elsewhere was contemplated.

All project supported in-country work was to be performed through national project coordinators and with national institutions who, with CATIE and ICAITI, would be responsible for site selection and all construction, testing, demonstration and dissemination activities. The use of Peace Corps Volunteers was also anticipated.

Assuming successful and socially acceptable demonstration of energy-efficient technologies, ICAITI was to utilize seminars, workshops and other means of orientating national technology, agricultural and other extension personnel to the alternative technologies.

The specific technologies identified in the Project Paper (PP) fall into three general technical categories (combustion technology, biogas, and solar energy) and, as envisioned in the PP, ICAITI's Fuelwood Team was organized in accordance with this classification. The combustion technologies included domestic fuelwood stoves, industrial kilns and ovens, charcoal kilns and biomass pyrolysis. Biogas, included both domestic and industrial digestor systems, and solar energy: fuelwood driers, hot-water systems, salt and crude sugar (panela) evaporators.

Project accomplishments during the first five years were evaluated by AID and ROCAP in 1984. The evaluation noted that,at that time, ICAITI had exceeded the number of demonstration units specified in the project paper and had trained over 3000 individuals. Consistent with the project purpose, ICAITI had clearly concentrated on the demonstration of energy efficient designs and renewable energy alternatives for rural areas. The 1984 evaluation concluded that, while ICAITI's accomplishments were impressive and consistent with the original project objectives, a more substantial dissemination effort was called for to take full advantage of the technologies developed and assure their successful transfer.

An amendment to the project was signed in 1985 to increase funding, extend the project completion date and amend the project description to focus "almost entirely on a more massive dissemination and extension effort." The major outputs for the extension were summarized as:

direct training of 3,200 individuals;

completion of 14 demonstration units;

dissemination of 30,000 technical publications; and

technical assistance to 500 commercial applications.

The final extension for the Project (to December, 1987) was granted by implementation letter in February 1987 to facilitate project close-out and documentation processes.

Table II-1.1 shows the evolution of project outlays and personnel distribution by component, since the beginning of the project.

1.2 Programmed Project Accomplishments

As shown in Table II-1.2, ICAITI surpassed nearly all programmed outputs which were used to measure progress. ICAITI is expected to surpass all output targets by the Project Action Completion Date (PACD). (As of April 1987, only the distribution of publications target was not yet reached. Even this target was almost fulfilled, with 98% of the programmed level already distributed. Given the expected distribution of a flurry of final technical reports at the end of the year, this goal should also be achieved.

ICAITI has also fulfilled general project agreement goals: "introduce alternate energy sources and technologies which can reduce fuelwood use and make use of other available renewable natural resources to produce energy for the target group... conduct training sessions and seminars, publish reports and disseminate the results of their work throughout the region... increase the awareness of the potential users of these technologies... and of government planners, national outreach agencies, volunteer organizations and private sector individuals..." In fact, it has fulfilled these objectives practically to the letter.

Table II-1-1
PROJECT PERSONNEL AND OUTLAYS
(In Man-Years and US Dollars X 1000)

YEAR:	1980	1981	1982	1983	1984	1985	1986	1987	TOTAL
OUTLAYS (US$ X 1000)	312.0	467.9	736.0	681.1	729.7	509.6	457.3	627.2 (Budget)	4,520.7
PERSONNEL (Man-Yrs):									
Adainistrative	2	2	2	3	4	3	3	4	23.0
Socio-Economic	2	2	2	1	1	0	0	0	8.0
Delegations	0	0	1	1	6	5	6	6	25.0
Publications (Ed.Tec.)	1	1	1	6	5	6	4	5	29.0
Combustion	3	3	4	6	6	4	6	3	35.0
Solar	4	4	4	3	3	4	4	3	29.0
Biogas	4	4	4	3	3	2	2	2	24.0
Other Technologies	0	0	0	2	3	4	4	4	17.0
TOTAL PERSONNEL	16	16	18	25	31	28	29	276	190.0

TABLE II-1.2

FUELWOOD PROJECT OUTPUTS PROGRAMMED AND COMPLETED

Project Output (defined in Amend.)	Number of Outputs Programmed *	Completed April 87
Seminars	43	36
Short Courses	143	263
Persons Trained	6,363	8,557
Workshops	46	83
Inst. Reps. Trained	97	483
Demonstration Units	491	495
Pub's. Distributed	69,694	68,141

* Based on outputs defined in Project Amendment of 1984: total programmed in amendment plus total completed at that time.

ICAITI has done an excellent job in responding to the donors requests and in fulfilling the specific project outputs and purpose established. This success, however, has not resulted in the type, quality and magnitude of impact for which potential exists. Nor does it imply that project benefits will continue in the future through self-sustaining mechanisms. Nor does the success necessarily reflect the attainment of the overall project goal: to improve the welfare and productivity of low income groups and increase the supply of low-cost energy for rural and urban poor. These issues have only recently been examined and were not given adequate attention in project design nor by subsequent project management in ROCAP and ICAITI.

1.3 Project Implementation Structure

ICAITI was expected to sign agreements with counterpart organizations in each country who would play a primary role in site selection, construction, testing, demonstration anddissemination activities.

The counterparts actually identified and utilized varied greatly in terms of their capabilities, number in each country, interest in FWAE, agenda and commonality of objectives, field personnel, and general ability to fulfill their responsibilities.

The resulting problems and limitations are discussed in detail in Section III of this report.

1.4 Issues Related to Project Design

It is relevant to consider the original design of the project because it established the agenda and much of the dynamic for what was to follow. This is specially true given the subsequent tendency of management not to attempt to significantly modify orientation of the project and to emphasize compliance with numeric outputs.

The FWAE project was initiated at a time when AID was undertaking a substantial number of fuelwood and alternative energy projects throughout the world. It is the team's impression that by and large these projects have had quite limited success; ICAITI's appears to have been one of the most successful among these. This suggests generic design faults, especially since some programs designed by other agencies were in fact considerably more successful. It would be instructive if AID were to evaluate this class of programs as a whole, seeking to identify common factors contributing to success or failure; in fact such a review is underway. The lesson learned could contribute to improved project design in the future, in the area of technology extension to the rural and informal sectors.

A feature of the project is that it predefined a wide range of technologies, together with rough levels of effort, based on quite limited market analysis. At the same time it neither emphasized the need for very considerable subsequent market analysis for prioritizing design and commercialization activities, nor did it make specific provision for this activity. More broadly, there was no discussion of what is important in the process of technology extension and no guidelines were established. Thus from the beginning there was introduced a bias towards a narrow engineering approach rather than a market oriented approach that history has taught is essential for successful implementation. Unfortunately, this bias fit only too comfortably with the existing institutional tendencies of ICAITI, something to which the designer should have been more sensitive. The stage was thus set for what followed: an emphasis on technical design and demonstration rather than practical field evaluations of utility with incorporation of feedback; premature demonstration and dissemination with little follow-up and numerous abandoned units.

The lack of attention to the extension and commercialization process and its corollary of market orientation (see Part 2, Section 3) was in our view the central flaw in project design. Some other related negative aspects were:

- Lack of closer analysis of what counterpart organization roles should be in the overall process; including implications of participation in different steps of the development/extension/commercialization process. There was no discussion of criteria of selection, while extremely diverse institutions were lumped together indiscriminately. The only counterpart to receive more careful attention was the Peace Corps;

- Concentration on energy efficiency as a criterion, leaving vague the issue of other user needs and preferences;

- Concentration on rural areas to the near exclusion of urban areas;

- Little consideration of the need to bundle technical assistance in multiple areas for the use of energy technology to be successful (e.g. the need to provide cooperatively food science and marketing assistance as well as agricultural product drying assistance); and

- No attention to the need for developing a pricing policy over time for ICAITI services.

Finally, it should be observed that ICAITI had almost no experience in dealing with the target groups in question, and very little with the technologies. The initiative came from AID, and ICAITI responded positively. It is unclear whether ICAITI management seriously considered how these activities could be usefully integrated into a broader institutional strategy and long-term organizational structure. The problems involved in the creation of large project appendage within an institution which at that time was 80% oriented towards the food processing industry were never addressed.

II. SERVICE IMPACTS AND POTENTIAL

2.1 Introduction

More interesting than the project outputs programmed are the estimates of project impacts in terms of people benefiting from the use of improved technologies and direct fuelwood savings, since these were the implicit objectives behind the training, demonstrations and publications distributed. No specific goals were established in the project documents for these overall objectives, but they offer a more realistic view of project impact.

Some of the more important project results and development impacts are summarized below:

- Successfully established awareness of technologies in over 50 counterpart institutions and with many potential users;
- Total beneficiaries (families or heads of household, presently receiving benefits) estimated at over 13,000;
- Over 400 small industries directly stimulated or established and over 1,500 people employed;
- Roughly 200,000 cubic meters of fuelwood conserved, primarily in critical, deforested areas - a significant positive environmental impact;
- Rural ceramic stoves in Guatemala nearing commercial viability via private sector;
- Established best woodstove research lab and personnel in region; these could be instrumental in supporting new projects targeting urban users;
- Several small industry successes achieved: lumber kilns, solar salt, PTR brick kiln, batch bread oven, ceramic stoves;
- ICAITI now recovering direct costs for Technical Assistance (TA) for solar and solar/combustion lumber kilns;
- High level of interest exists in follow-on projects at national and local levels;
- FWAE activities and relationships established with many dissemination counterparts will be useful and, in fact, have led to demand for ICAITI services in support of new, small enterprise development projects;
- ICAITI has gained experience and knowledge which, with

- strong market orientation and improved management, could lead to increased impacts in the energy sector and in new, productive, small enterprise applications of technology;

- Over 90% of project beneficiaries were women, the vast majority being rural women; and

- The project served as an important counterpart to Peace Corps programs in the region.

Table II-2.1 lists the principal technologies and models developed by ICAITI and provides data concerning the number of units built and in use as follows:

(a) The first column indicates the number of demonstration units built (Demos. Built). These units received both technical assistance and financial support from ICAITI for their construction.

(b) The second column notes the number of units built as a result of direct technical assistance and supervision from ICAITI (Dir. TA Built).

(c) The next two columns list, first, estimates of the number of additional units of this design built indirectly as a result of literature, training and other dissemination activities (based upon units of which ICAITI has knowledge, field visits and previous studies/evaluations), and, second, the percentage of total units built in this way.

(d) The final columns estimate the number of units in use and the percentage of total units built in use.

It should be stressed that the information represents the evaluation team's best estimates based upon the information it was able to collect and analyze during its relatively brief period of activities in Central America.

Some general conclusions can be drawn from Table II-2.1 concerning the acceptability and successful transfer of individual technologies. The most highly accepted designs so far in terms of the percent in use for those with at least 5 units built are:

Designs Accepted

- lumber kilns
- solar salt technology
- modified Brazilian charcoal kilns
- ceramic (3 pot, pre-fabricated) cook stoves
- institutional and productive stoves
- low cost ceramic kilns (for stove components) and
- batch bread ovens

TABLE II-2.1
UNITS BUILT AND IN USE

Component & Process	Models	(a) Demos. Built	(b) Dis.TA Built	(c) Others Built	(c) % Other of Tot.	(d) Total Built	(e) Units In Use	(e) % In Use
Combustion								
Bread Ovens	Batch Oven	7	19	21	45%	47	35	74%
	Continuous Oven	0	13	0	0%	13	3	23%
Brick Kilns	2-Chamber Brick kiln	4	1	1	17%	6	1	17%
Lime Kiln	Continuous Flow Kiln	1	0	0	0%	1	0	0%
Ceramic Kiln	Low-Cost Batch Kiln	4	2	4	50%	8	6	75%
Charcoal Kilns	Modif. Beehive (Brazil)	1	0	34	97%	35	32	91%
	Portable Metalic	2	0	0	0%	2	1	50%
Salt Evaporator	Improved Stove	1	0	0	0%	1	0	0%
Crude Sugar Prod.	Bagasse Fired (Guate.)	2	7	0	0%	9	6	67%
Biomass Gasifier	Gasifier	0	0	0	0%	0	0	
	Combusiton Subtotals:	22	40	60	49%	122	84	69%
Cook Stoves								
Semi-Industrial	"Institutional" Stoves	5	16	22	51%	43	35	81%
Domestic	Lorena & Similar Designs	550	3,650	12,350	75%	16,550	11,500	69%
	Pre-fab. 3-H Ceramic	560	500	3,130	75%	4,190	3,800	91%
	Pre-fab. "Urban" Stoves	0	0	0	0%	0	0	0
	Cook Stove Subtotals:	1,115	4,166	15,502	75%	20,783	15,335	74%
Solar								
Lumber Kiln	Solar & S/C, Various size	6	5	0	0%	11	11	100%
Fish Preservation	Tent, Demo units	21	7	0	0%	28	0	0%
Agric. Dryers	Various	43	18	11	15%	72	13	18%
Salt Evaporation	Black Plastic	7	5	130	92%	142	137	96%
Water Heating	Primarily flat plate	4	0	0	0%	4	3	75%
	Solar Subtotals:	81	35	141	55%	257	164	64%
Biogas								
Low Cost Digestor	Low Cost Digestor	5	16	1	5%	22	5	23%
Conventional Digester	Conventional Digester	15	33	6	11%	54	27	50%
Dry Digester	Dry Digester	1	0	0	0%	1	1	100%
Packed Bed	Packed Bed	1	0	0	0%	1	0	0%
	Biogas Subtotals:	22	49	7	9%	78	33	42%
Others								
Agric. Dryers	Solar/Combustion	4	0	0	0%	4	3	75%
Hydro Electric	Micro-Hidroelectric	0	0	0	0%	0	0	0
	Other Subtotals:	4	0	0	0%	4	3	75%
	TOTALS	1,244	4,290	15,710	74%	21,244	15,619	74%

NOTE: Estimates presented in Tables of this Section were prepared by evaluation team and are based upon the information supplied by ICAITI, national counterparts, previous evaluations and spot visits with beneficiaries.

The designs with the least acceptance so far (with less than 25% in use and at least 5 units built) are:

Designs with Low Acceptance

- solar fish dryers
- two-chamber brick kilns
- solar agricultural dryers
- low cost digestors
- continuous bread ovens

Another facet of design acceptance and dissemination is the capacity and interest of private sector individuals an other institutions to promote and/or construct the units. The result of this capacity or interest is reflected in the column indicating the % of units built by others. It is also interesting to differentiate between the designs which are being built primarily by others due to private sector initiative (profit motive) and those which are primarily supported by other institutions with political, developmental, or religious motives. The construction of relatively large numbers of the following designs has apparently occurred as a result of their suitability for transfer to other entities.

Designs Promoted and Built by Others

Design	Sector
Charcoal kilns	Private
Solar Salt Evap.	Private with public incentives
Lorena type stoves	Public
Ceramic stoves	Private and public
Batch bread ovens	Private and public
Institutional stoves	Private and public

Nearly all the designs with high acceptance have had significant private sector intervention and participation in their promotion. The only high acceptance designs without private sector intervention, lumber kilns and the "unpromoted" ceramic kilns, are promoted directly by ICAITI.

Private sector users of the initial lumber kilns have agreed to open their facilities to visitors as part of the continuing promotion activity by ICAITI.

Table II-2.2 lists the technologies, along with estimates regarding project inputs and their impacts to date as detailed below.

(a) Estimate of man-years of project labor invested in each technology. Since labor costs (plus overhead) represent over 60% of the total project budget, one can assume that the man-years

Table II-2.2
Project Inputs and Impacts

Models	(a) Project Man-Yrs	(b) Promotional Status	(c) F-Wood Conserved M3	% Tot.	(d) Total Benef's Num.	% Tot.	(e) Sust.Empl.Created Num.Jobs	% Tot.	(f) Sm.Indust.Benf'd Number	% Tot.
Combustion:										
Batch Bread Oven	3	Promo Since 1983	1,300	1%	133	1%	75	4%	43	10%
Continuous Bread Oven	3	Promo Since 1985	0	0%	9	0%	6	0%	3	1%
2-Chamber Brick kiln	3	Promo Since 1983	100	0%	37	0%	30	2%	7	2%
Continuous Lime Kiln	2	Not promoted	0	0%	0	0%	0	0%	0	0%
Low-Cost Ceramic Kiln	1	Not promoted	?	0%	18	0%	0	0%	6	1%
Mod.Brazil Charcoal Kiln	1	Promo Since 1984	9,500	5%	83	1%	50	3%	[illegible]	8%
Portable Charcoal Kiln	2	Promo 1984-85	100	0%	5	0%	1	0%	[illegible]	0%
Improved Salt Evap. Stove	1	Not promoted	0	0%	0	0%	0	0%	0	0%
Crude Sugar Evap.(Bagasse	1	Promo Since 1985	600	0%	28	0%	20	1%	8	2%
Gasifier	1	Not Promoted	0	0%	0	0%	0	0%	0	0%
Combusiton Subtotals:	18		11,600	6%	313	2%	182	10%	101	23%
Cook Stoves:										
"Institutional" Stoves	2	Promo Since 1983	800	0%	140	1%	75	4%	30	7%
Lorena & Similar Designs	9	Promo 1981-87	62,100	33%	6,000	46%	10	1%	10	2%
Pre-fab. 3-H Ceramic	5	Promo Since 1985	10,640	6%	3,950	30%	150	9%	90	20%
Pre-fab. "Urban" Stoves	1	Not promoted		0%	0	0%	0	0%	0	0%
Cook Stove Subtotals:	17		73,540	39%	10,090	78%	235	14%	130	30%
Solar										
Lumber Kiln	8	Promo Since 1985	0	0%	66	1%	55	3%	11	3%
Fish Preservation	3	Promo Since 1984	0	0%	10	0%	0	0%	0	0%
Agric. Dryers	8	Promo Since 1984	500	0%	103	1%	50	3%	13	3%
Salt Evaporation	3	Promo Since 1984	100,000	54%	1,337	10%	1,200	69%	147	33%
Water Heating	8	Promo Since 1984	0	0%	1,004	8%	0	0%	0	0%
Solar Subtotals:	30		100,500	54%	2,52[illegible]	19%	1,305	75%	171	39%
Biogas:										
Low Cost Digestor	7	Promo Since 1983	7[illegible]	0%	5	0%	0	0%	5	1%
Conventional Digester	11	Promo Since 1982	810	0%	29	0%	2	0%	29	7%
Dry Digester	4	Promo Since 1986	5	0%	1	0%	0	0%	1	0%
Packed Bed	2	Not Promoted	0	0%	0	0%	0	0%	0	0%
Biogas Applications	4	For all above								
Biogas Subtotals:	28		890	0%	35	0%	2	0%	35	8%
Others										
Solar/Combust. Dryers	6	Promo Since 1986	100	0%	23	0%	15	1%	3	1%
Others (not specified)	5									
Micro-Hidroelectric	1	Not Promoted	0	0%	0	0%	0	0%	0	0%
Other Subtotals:	17		100	0%	23	0%	15	1%	3	1%
TOTALS	105		186,630	100%	12,981	100%	1,739	100%	440	100%

invested provide a rough estimate of overall project investment in each category. Since the man-years sum to approximately 100, the numbers presented offer a rough estimate of the % of project outlay for each technology.

(b) The promotional status of each technology is noted in terms of the periods during which ICAITI has offered courses and literature about each technology. This is not a consistent measure of the promotion actually executed by ICAITI since no clear promotional programs have been designed. No technology for which promotion was begun has had a clear and definitive end to its promotion.

(c) Cubic meters of fuelwood conserved as a result of the actual use of the design (M3 F-Wood Conserved) and the percentage relative to total project fuelwood conservation. Only fuelwood directly conserved is noted. Not included here are estimates of mangrove forest saved due to using ICAITI-promoted plastic technology on the coast of Guatemala, for example, nor the energy value of rural solar and biogas applications which are not directly conserving fuelwood because they are being utilized for new applications.

(d) Total beneficiaries include families that directly receive benefits through the use of a new technology, people employed on a sustainable basis as a result of the use or construction of the new technologies, small business owners who have increased their income, productivity or profits as a result of the new technology and a limited number of organizations which are actively using the technology as a tool for obtaining other, broader, objectives. The numbers are in terms of families or heads-of-households (family members are not included).

(e) Sustained employment generated is broken-out from total beneficiaries of the estimate of permanent employment which has resulted from the adoption of the technologies.

(f) Small industries benefiting specifies the number of productive, private sector entities or businesses directly benefiting. This includes both businesses using and building the technologies.

As can be observed in Table II-2.2, the fuelwood conservation benefits are mostly a result of the solar salt technology and cook stoves. Overall, three quarters of the families benefiting are a result of the cook stove activities. Small industry and employment benefits are predominately a result of the solar salt technology.

It is interesting to note that cook stove and solar salt technologies represent at most 20% of project investments, but they have resulted in over 90% of the fuelwood savings, 88% of total beneficiaries and 83% of the jobs generated. These two technologies, cookstoves and solar salt, have clearly been the greatest successes of the FWAE project thus far, in terms of the overall project goal "to improve welfare and productivity of low-income groups".

Table II-2.3 looks at some of the factors affecting the sustainability of the stream of project benefits. Due to the lack of market orientation in the past and the resulting lack of data corresponding to the markets for these technologies, the information in this table is subject to significant modification. Again, the best available estimates are presented. Some data items are subjectively based upon interviews and visits with beneficiaries. The columns include:

(a) Estimates of interest and demand in the general sector (small, wood -burning bakeries, for example). The level of demand depends on a variety of factors, including the energy intensiveness of the sector, the influence of energy in the costs of production, the cost and availability of wood fuel and alternative fuels and technologies, etc. These subjective ratings of interest or demand also reflect an analysis of the results of dissemination efforts as presented in the previous two tables.

(b) Number of units for which Technical Assistance (TA) has been sold by ICAITI at over 75% (roughly) of costs (TA Sold).

(c) Estimate of potential market and/or beneficiaries. This is one of the areas that requires much more analysis.

(c1) The first sub-column (for process) includes an estimate of the total market or number of beneficiaries for a given sector (number of small bakeries using fuelwood, for example) based upon the preliminary estimates made by ICAITI in 1979 and additional information from delegations and others (for lack of any better sources). This column looks at the total group within a category (e.g., all families using wood for cooking).

(c2) The second sub-column (% Tot.) shows the relative percentage of the estimated total market (potential beneficiaries) for the project (cook stoves make up 98% of the projects total number of potential beneficiaries).

(c3) The final sub-column (Beneficiaries for Model) is an effort to make a more realistic estimate of the market in number of units for the specific designs which ICAITI presently has available, taking into consideration the sectorial demand as well.

(d) The next heading in Table II-2.3 (Self-Sustain?) examines the present sustainability of the technology. The first sub-column (Country) lists the countries in which the technology has reached a minimal degree of self-sustainability. The second sub-column (# Pvt) provides an estimate of the number of private sector individuals or businesses active in dissemination for business motives.

Table II-2.3
Sustainability

Models	(a) Sector Demand	(b) TA Sold >75%cost	(c1) Estim.of Potent.Mkt--Benef's. for Process-	(c2) % Tot. /	(c3) for Model	(d) Self-Sustain? Country	# Pvt	(e) Who else promo/working with the technology?
Combustion:								
Batch Bread Oven	Moderate	0	25,000	1.0%	5,000	ES	5	COMAFAN, PVOs & GOs
Continuous Bread Oven		0			0	no		
2-Chamber Brick kiln	High	0	3,500	.1%	0	H?(PTR type)		PTR (modified model)
Continuous Lime Kiln	V. High	0	800	.0%	0	no		PTR (batch model)
Low-Cost Ceramic Kiln	Moderate	0	2,000	.1%	500	no		
Mod.Brazil Charcoal Kiln	Low	0	1,000	.0%	100	C	1	Pvt. Sector Ind. (CR)
Portable Charcoal Kiln		0			0	no		
Improved Salt Evap. Stove	Low	0	20	.0%	0	no		
Crude Sugar Evap.(Bagasse	Moderate	0	500	.0%	100	no		GOs in Panama
Gasifier	Unknown	0	?		0	no		
Combusitor Subtotals:		0	32,820	1.3%	5,700			
Cook Stoves:								
"Institutional" Stoves	High	0	4,000	.2%	1,000	H,ES	3	PVOs, GOs, PTR
Lorena & Similar Designs	Moderate	0	2,500,000	97.9%	13,000	G,H,ES	2	Many PVOs, GOs, PTR
Pre-fab. 3-H Ceramic	Moderate	0			50,000	G,H	50	PVOs, PTR
Pre-fab. "Urban" Stoves	V. High	0			400,000	no		INAFOR (Guate)
Cook Stove Subtotals:		0	2,504,000	98.1%	464,000			
Solar								
Lumber Kiln	V. High	3	50	.0%	20	All		Only ICAITI
Fish Preservation	Low	0	4,000	.2%	0	no		GOs
Agric. Dryers	Moderate	0	4,000	.2%	200	no		PVOs, GOs
Salt Evaporation	Low	0	300	.0%	300	G,H	20	GOs, PTR
Water Heating	Unknown	0	?		0	no		Pvt. Sector?
Solar Subtotals:		3	8,050	.3%	620			
Biogas:								
Low Cost Digestor	Low	0	1,000	.0%	100	no		Many PVOs, GOs, PTR
Conventional Digester	Low	1	1,000	.0%	200	G	1	Pvt. Sector,PVOs, GOs
Dry Digester	Moderate	0	1,000	.0%	250	G	1	Pvt. Sector, GOs
Packed Bed	Unknown	0	?		0	no		
Biogas Subtotals:		1	3,000	.1%	550			
Others								
Solar/Combust. Dryers	High	0	4,000	.2%	500	no		
Micro-Hidroelectric	Unknown	0	?		0	no		GOs
Other Subtotals:		0	4,000	.2%	500			
TOTALS		4	2,552,620	100.0%	471,450			

(e) The final column (Who else promo/working with the technology?) provides a preliminary listing of the types of groups presently active in the dissemination and promotion of the technology.

Table II-2.3 presents the situation in terms of market estimates and sustainability. On the market side, there appears to be a current and sharp-felt need for such technologies as fuel-saving brick kilns, lime kilns, institutional stoves, urban stoves, lumber kilns and solar/combustion agricultural dryers (primarily for coffee and cocoa).

Despite this demand, technical services for the supervision of the construction of units have been sold at near cost by ICAITI for only 3 solar lumber kilns and 1 conventional digestor. An additional 3 proposals for lumber kilns are in process and the El Salvador delegation is confident that technical assistance can be sold on a sporadic basis for the construction of batch bread ovens in San Salvador.

In terms of the potential markets (number of users potentially interested in the technology), domestic stoves represent by far the largest share of the market, with 98% of the total. The remaining two percent of the market is represented by small bakeries, followed by institutional and productive woodstove users (tortillas, cassava, preserves, etc.), agricultural drying, fish preservation and brick kilns. In terms of the size of the market and sectorial demand combined, urban stoves are by far the highest priority.

Regarding the attainment of a self-sustainable flow of benefits, the following points are evident:

- The batch ovens appear to be self-sustainable in El Salvador, almost exclusively due to the private sector impetus they have received from COMAPAN and builders, complemented by ICAITI in-house expertise.

- Institutional stoves and Lorena-type stoves will continue to be disseminated at a relatively slow rate in the 3 northern countries, primarily by public sector and development oriented organizations (mostly PVOs).

- The ceramic stove dissemination is picking up steam in Guatemala due to a combination of private sector and PVO impetus. The Rural Technology Project (PTR) (ICAITI's counterpart in Honduras, which is funded by AID), is finishing up a field evaluation of the ceramic stove and is expected to sustain its promotion in Honduras.

- The lumber kilns are expected to be sustained by ICAITI promotion and sales.

- The black plastic solar salt technology has reached self-sustaining status in Guatemala primarily due to private initiative and, secondarily, government incentives. Solar technology in general is also self-sustaining in Honduras and PTR continues to support the black plastic alternative.

- Biogas is being supported by a large host of government and PVO-type organizations. In Guatemala, at least two private sector individuals sell technical consulting services for digestor design and construction. Other agencies offer technical assistance for free within budget and geographic limitations.

Therefore, even if ICAITI only continues with the promotion of the one technology where cost recovery from the direct beneficiary is considered feasible (lumber kilns), many of the technologies developed will continue to be disseminated and promoted. The rate and geographical breadth of actual dissemination and the quality of assistance provided, however, will undoubtedly not be optimal.

In conclusion, it is evident that the designs which have received the most input and participation from private sector disseminators (builders, commercial middle-men, etc.) have had the greatest rate of acceptance and present the most likely candidates for continuity independent of ICAITI. This is characteristic of similar projects world-wide.

Individual technologies are discussed in the following section grouped under the general component headings:

- combustion
- cook stoves
- solar
- biogas
- other

2.2 Evaluation of Specific Technologies - Combustion Component

2.2.1 Bread Ovens

The original study on which the project design was based identified bread ovens as by far the largest consumer of fuelwood in the small industrial sector of Central America, representing nearly half of total consumption in the sector. It is understandable that the project has given a fairly high priority to this sector, having developed two different designs and prepared four promotional publications.

47

Since the preliminary study of 1979, which estimated the number of small bakeries in Central America based upon flour consumption statistics, no additional market study has been performed. Questions remain concerning the number of small, wood-fired, bakeries, their growth rate, fuel use/transfer trends, felt needs, etc.

The first improved design developed by ICAITI was a batch oven, which included separate racks to increase the usable space in the oven. This design was followed by a continuous oven, which ICAITI considered still more efficient, and began to promote in 1985 instead of the batch design.

Since the preparation of the original manuals and plans, both ovens have undergone a series of improvements at the hands of delegation assistants, intermediary technicians and users. At this time, it appears clear that the continuous oven is not appropriate for the market and has many serious flaws in its design. Of 13 continuous ovens built, only 3 appear to be in regular use, and these suffer from problems such as uneven heat distribution and low fuel efficiency. The continuous oven appears to be too small for larger industries, while the continuous operation process is too demanding in labor for the smaller bakeries.

The batch oven has been well-received, especially in El Salvador where it has been promoted by COMAPAN, a large marketing organization for flour and other bakery inputs. Another smaller flour firm has recently expressed interest in promoting the design as well. Both believe that by promoting the ovens (and providing loans for their construction), they will win and maintain new clients. Some 35 batch ovens are in use, about 75% of the total built. The remaining 25% were either destroyed in the El Salvador earthquake, were built by users on unowned property and had to be abandoned, or were built by group business ventures that have since dissolved. The batch ovens appear to consistently save 20-30% of the fuelwood that would have been consumed by a traditional design for the same amount of bread.

The bread ovens are representative of two important issues:

1. ICAITI's lack of market orientation. Not only does ICAITI have no information about the trends and needs of the market, but it has refused to accept the market's preference for the batch oven. The project manager maintains that the project is still trying to convince delegates not to promote the batch oven and to promote the continuous oven instead. The technicians in ICAITI-Guatemala still uphold the claim that the continuous design is best. They see the problem with dissemination as one of "lack of user training". ICAITI must become more market oriented and responsive if it intends to be successful in this type of endeavor.

2. The involvement of the private sector, a commercial intermediary, in the successful dissemination. In this case, both individuals trained by ICAITI in the construction and, especially, COMAPAN have been instrumental in the successful dissemination of the batch oven in El Salvador. ICAITI should learn from this experience and direct future efforts precisely at the most interested private sector intermediaries.

Given the concentration of bakeries around San Salvador and the availability of plans and masons with experience in building the batch oven, and the expertise with this technology of ICAITI personnel working in El Salvador, it can be expected that the dissemination of the batch oven will continue in El Salvador in a self-sustaining manner. The El Salvador delegation has established a policy of selling supervisory TA at cost (roughly US$ 100) to individuals interested in building the batch oven.

The high price of fuelwood in El Salvador has sharpened interest in the fuelwood-efficient ovens and in the possibilities of using cheap conventional fuels (kerosene and diesel). One possibility would be to develop fuel-efficient designs specifically for such commercial companies as those mentioned above, allowing them to put their trademark on it and use it in their promotional activities.

Recommendations concerning bread ovens:

- Stop promoting the continuous design, and recall all related promotional materials.

- Have El Salvador ICAITI assistant (technician) visit PTR counterparts in Honduras to share information and develop the revised plans and manuals for the improved batch bread oven to replace previous publications.

- The El Salvador assistant should also review the final report on the bread ovens being prepared for project closeout. This report should include a frank evaluation of the experiences with the bread ovens.

- Investigate possibility of selling specialized, improved oven designs (which may use conventional fuels) to commercial entities similar to COMAPAN in other countries.

- Perform prior market analysis and use participatory approach to developing any future innovations.

- Continue selling supervisory TA at cost to interested individuals.

2.2.2 ICAITI Brick and Tile Kiln

The primary innovations in the ICAITI design were an enclosed dome ceiling for the kiln and a second, raised chamber where heat from the first chamber could pre-dry and pre-heat the bricks or tiles in the second.

Six ICAITI kilns have been built, and not one is currently in regular use. Users suffered large numbers of rejects and customer rejection of the "smoked" product which came out of the second chamber. However, PTR in Honduras has modified the design (retaining the shape and dome of the ICAITI kiln, adding an additional firebox, and removing the second chamber) and appears to have an overwhelming success. The modifications were made with the participation of users and artisan masons who had tested the original design. The result is a kiln which is much cheaper, still very efficient (over 50% savings reported by users), and which works even better than traditional kilns (less rejects).

The brick and tile industries in each country tend to be extremely concentrated in regions where appropriate clay soils are accessible and therefore cause a concentrated demand for fuelwood which often results in localized deforestation, making this a strategically important technology. Also, brick production with fuelwood is relatively energy intensive and the rising costs of wood have made this a significant aspect in overall production costs. Finally, fuelwood is becoming more and more scarce in concentrated brick/tile production areas. As a result, there is a relatively high demand for fuel-saving technologies.

Recommendations concerning brick kilns:

- Halt promotion of the present ICAITI design.

- Review PTR and other's modifications and results and prepare conclusions on the state of the art improvements in brick kilns. This analysis should become part of the final documentation/report.

- Assess potential for national-level projects to promote most appropriate existing designs (presently appears to be PTR's modification of ICAITI design) in conjunction with development agencies and those concerned with forest resources.

2.2.3 Lime Kiln

ICAITI designed and built one prototype of a continuous flow lime kiln in Guatemala. As with the bread oven, the continuous flow design does not appear appropriate for the clientele (rural artisans). There is little doubt that the continuous flow design fulfilled the

objectives of the project in terms of being more energy efficient, but the project design and execution did not include the necessary analysis of markets for the technology and user participation in development that are crucial for replication and continuity of benefits.

The experience is exemplary of the lack of market-client orientation in the fuelwood project. In this case, the group involved had not successfully produced lime as a business venture and clearly hoped to receive assistance for more than just the technological aspects of the project. Also, due to a lack of access roads, it is nearly impossible to get to the site during much of the year. Additionally, the kiln was built in a gully and had constant drainage/moisture problems. The kiln was tested once but the users did not follow ICAITI instructions about maintaining a constant fire and the results were negative. The kiln was located far from the users' homes and many were not willing to take their turns running the kiln at the isolated mountain site all night and day. ICAITI then stopped the project in early 1985 and made no decision concerning its future or the future of the development of lime kilns in general.

As with brick and tile production, lime production tends to be centralized in specific geographic areas and can cause deforestation due to the intense fuel consumption in the process. There is clearly great potential and demand for more fuel-efficient lime kilns appropriate for small industries. PTR is now working on a design which, again, is an adaptation of ICAITI technologies. It is recommended that ICAITI collaborate with PTR in the development and testing of the improved lime kiln in Honduras. It would also be beneficial for FWAE personnel to study this case as an experience from which lessons can be learned.

2.2.4 Charcoal Kilns

ICAITI adapted a Brazilian bee-hive design which has been very successful in Costa Rica, where nearly all of some 27 units built remain in use. In many instances, the kilns are being fueled with refuse from tree farms for pole lumber, making good quality charcoal from tops and refuse. Traditional techniques were not capable of this. In effect, this reduces the need to cut trees for charcoal production. Costa Rica is the only country where this sort of tree harvesting is common.

This is another case where private sector initiative has been the primary impetus for successful dissemination. An engineer employed and given additional training by ICAITI has gone into the business of providing technical services for the construction of the kilns. He has been the direct supervisor for nearly all kilns built.

ICAITI also designed and tested a smaller, semi-portable, metal charcoal kiln. Two demonstration units were built, one of which is still used sporadically. This kiln was considered too costly by users.

Artisan charcoal production using traditional methods is very inefficient. Dissemination of the improved technology to artisans, however, is nearly impossible as they often work clandestinely due to existing deforestation laws and their tendency to make unauthorized use of private or public forest. They would also require financial assistance and a permanent base of operations where they could locate the kiln. Therefore, massive dissemination of the new technology is unlikely under present socio-economic-legal conditions. The production mix in most countries appears to be a few industrial producers and many micro (clandestine) producers, with few legitimate small industry producers who would be interested in ICAITI's design.

Interest exists in the possibilities of producing charcoaland solid fuels from agricultural wastes (rice hulls, coffee pulp, etc.) available throughout the region. ICAITI could pursue new, follow-on project opportunities in these areas.

2.2.5 Improved Fuelwood Salt Evaporator

Traditional salt production in Honduras has involved the concentration of salt in sea water using solar ponds and then the final crystallization of the salt in large metal pans over wood fires. The process is relatively inefficient and resulted in almost complete deforestation of mangrove forests around the salt-producing centers on the Gulf of Fonseca.

ICAITI developed an improved stove using mud and brick which appeared to save 20-30% of the fuelwood in initial tests. Before testing was complete, however, the decision was made to halt testing and promotion of the stove and concentrate entirely onthe promotion of solar alternatives which use no fuelwood. The decision was apparently influenced by national laws making it illegal to cut mangroves and by PTR. In retrospect, it appears clear that the decision was justified; the cooked salt production has steadily decreased and is nearing extinction while solar salt production has quickly come on line to replace it.

2.2.6 Bagasse Fired Crude Sugar Evaporator

Traditional production of crude sugar in most of Central America uses bagasse as a fuel in the evaporation process. In Panama, however, sugar production relied entirely on fuelwood. This is an exemplary case of technological transfer between countries facilitated by the project. Traditional technology from Guatemala was transferred to users and Government agenciesin Panama, where it is reported to be successful. Much more information should be assembled for the final report.

2.2.7 Gasifier

ICAITI developed and performed lab tests on a gasifier designed to use corn cobs for the production of direct heat and fuel for small farm/industry applications. According to project managers, development was halted because the technology was considered to be too complicated and costly for the rural poor identified as target population in the project paper. It is mentioned here as an example of the rigid non-questioning adherence to project design parameters, without studying the market in order to make more rational decisions concerning the justification and strategies behind the development/adaptation of new technologies.

2.2.8 Low Cost Ceramic Stove Kiln

This kiln was developed and introduced by the ceramic stove technician at ICAITI as a result of the demand identified while training traditional ceramists in the construction of pre-fabricated stove components. Many small, traditional ceramists were using no kiln. They simply fired their pieces in an open pile or in a small excavation. The improved kiln is cheap and easy to build, but more than twice as efficient in fuel (primarily wood) as the traditional process. Although this is not considered as one of the technologies developed as a result of the project, many kilns were observed in use during evaluation spot visits, including some supported by PTR (demonstrating secondary impacts of even this technology) and other ceramists mentioned their intentions to build one.

The kiln was not designed in ICAITI labs. It merely pulls together some of the best aspects of traditional kilns observed and was promoted as a response to a need. The design is not especially innovative, but it is low-cost, easy to build and maintain, and facilitates production of the ceramic pieces with minimal rejects.

Given the large number of small ceramists in Central America, it is recommended that the design be evaluated and documented as part of the project close-out process.

2.3 Evaluation of Specific Technologies - Cook Stove Component

2.3.1 Institutional Stove

The institutional stove was designed by ICAITI as a spin-off of the domestic stove projects at the request of a school for an improved stove. The design has been widely adapted and modified and has different names according to country/modification/use (productive stoves in El Salvador and Costa Rica, tortilla stove in San Salvador,

cassava stove in Honduras, etc.). Despite its relative success, efficiency and acceptance, the stove has been given very low priority in ICAITI apparently because combustion personnel were too occupied with more technical designs (lime kiln, continuous bread oven, etc.). Follow-up of the design modifications is lacking.

The stove has been successful in assisting to establish and/or support roughly 30 small businesses, mostly tortilla makers, but also for jams, preserves, cassava preparation, etc. Some masons have also specialized in the construction of the stove as a business. In San Salvador, development and credit institutions have been giving loans and assistance for construction of the stoves as part of their support for the informal productive sector. Delegation assistant in El Salvador calculates that the loans are easily paid back in less than two months of fuel savings.

This technology has had a definite impact on women as it eases their cooking burden, removes smoke and reduces costs, resulting in effective economic, housing and welfare improvements. It also responds to the deforestation problems in the urban areas, where it is most critical.

Recommendations:

- Put more resources into follow-up and evaluation of the many modifications of this stove, and document these and the respective conclusions in the final report.

- Look into potential follow-on projects, or include this as a component of new, urban stove programs.

2.3.2 Fuel Efficient Domestic Cookstoves

As with other technologies, ICAITI fulfilled the original project objectives by 1984 with the testing and demonstration of a series of fuel-efficient cookstoves and the preparation of related documentation. Of all the models tested, the Lorena and Choola designs were identified as the most appropriate in terms of the project goals of improved efficiency and acceptability. ICAITI trained 40 counterpart institutions in the construction of these stoves (over 200 people) and supported their dissemination through some 80 seminars, courses and workshops.

In this case, however, ICAITI was not satisfied with the results of the activities prescribed in the project paper, and went on to investigate and develop other alternatives.

ICAITI found that an extremely high level of know-how was required to design, select materials, and build one of these improved stoves correctly. The intensive, long-term training and follow-up required to

64

achieve this level of know-how, the time required to properly design and build the stove, and the institutional capacity required to maintain a high level of quality in stove construction, implied costs prohibitively high for the successful dissemination of the stoves. Many attempts were made by different organizations to initiate small, private, businesses based upon stove construction; none could be identified that endured any significant period of time once donor intervention terminated.

Numerous studies of these stoves have been executed in Guatemala, where over 40 institutions (including ICAITI) have been active in the dissemination process of the Lorena type stoves during the past decade. It is estimated that about 10,000 Lorena stoves have been built (less than 1,000 per year), and evaluations have encountered that over half of these were built improperly, thereby reducing or eliminating their potential for fuel savings.

In 1984, ICAITI began research and testing to identify an alternative design possessing the desired qualities of the stoves tested previously - use of local materials, smoker removal/chimney, prestige, multiple burners for simultaneous cooking, high efficiency - but which avoided the problems associated with their dissemination, primarily of quality control in design and construction.

After evaluating a variety of materials, ICAITI came up with a design for a pre-fabricated ceramic stove. ICAITI found that small scale ceramic industries abound throughout the region, and are currently undergoing a period of crisis as imported plastic and aluminum articles have replaced many traditional ceramic products. The ceramists are, therefore, interested in new products and ways to increase incomes.

The ceramic stove design eliminates the high degree of technical expertise required for stove installation, reduces the amount of time required for training and installation, eliminates the problems of locating the appropriate clay and sand materials in each individual site (required for Lorena construction), and has resulted in greatly increased average fuel savings.

As with other technologies, no formal decision was made by ICAITI management to go from testing to demonstration and promotion. However, field tests were performed and training courses were organized for ceramists so they could learn how to produce the pieces. PCV and PVO counterparts began promoting the stoves and creating demand for the pieces. Since 1985 when the first stoves were field tested, over 3,500 stoves have been sold by artisans in Guatemala despite the lack of an organized promotional plan or campaign. This is impressive considering previous experience with massive, rural stoves in Central America. Courses were also given in other countries but there has not been sufficient follow-up to determine their full impact. The evaluation

team did note, however, that ICAITI had succeeded as a "second line" trainer by training PTR personnel who then went on to act as trainers for additional ceramists in other areas, thus significantly increasing the breadth and scope of impact.

It is estimated that over 95% of the direct beneficiaries of the fuelwood project are a result of the domestic stove activities (which represent only about 16% of project budget). Women have been the primary beneficiaries: as cooks receiving benefits in economies of fuelwood, time for collection and cooking, improvements in the kitchen environment, less scalding and burns (esp. of children), less smoke problems to eyes and lungs, and increased prestige; as ceramists increasing their profits and income by a large margin with the sale of the ceramic pieces (most ceramists trained have been women), and even as installers of the stoves. In one part of Guatemala a women's coop has gone into business selling and installing stoves which they purchase from ceramists in other areas.

While the stoves have been developed and promoted as a rural technology, it is clear that many are being installed in urban and semi-urban settings where more people buy fuelwood. This is only natural since the stove does cost Q 15 (about US$ 5.50) and a completely installed stove, with an outsider hired to buy all the pieces and do the installation, can run up to Q 70 (US$ 26). In rural areas there is less cash on hand and less economic justification for a fuel-saving stove since most wood is collected rather than purchased.

Other results of this component include the establishment of the best stove lab available in Central America and perhaps the most experienced personnel in stove design, and testing. The project developed its own methodology for testing before international norms were available and now has expertise in standardized/international testing procedures. This is a component which has shown a continuing process of improvement and evolution; a process which is far from completion.

As a result of the relative success of the pre-fabricated ceramic stove and an initial analysis of its weaknesses, the project has recently begun to develop smaller, more marketable models appropriate for the more concentrated urban markets which are more critical in terms of deforestation and also more accessible for new technology as there exists a clear market incentive for fuel-savings. ICAITI is presently preparing to do a market test of various stove designs in collaboration with INAFOR in Guatemala.

Recommendations:

- Provide follow-up to establish status and interest in stove program throughout region.

- Since this has been the largest impact component it deserves special attention in the preparation of its final report.

- ROCAP provide support to ICAITI to identify additional sources of financing for the continuation of the urban stove activities, especially in Guatemala, Honduras and El Salvador.

- ICAITI urgently develop national level projects for the development of commercially marketed stoves.

2.4 Evaluation of Specific Technologies - Solar Component

2.4.1 Solar Lumber Kiln

ICAITI has been promoting this technology since 1985. To date, six demonstration units have been built and 5 other units have been completed. ICAITI is in the process of providing technical assistance (supervision) for three more units on a cost recovery basis - the only example of cost recovery in the project. There are three more proposals in process. While this has been one of the most successful technologies developed by the project in terms of cost recovery and % of units in use of those built, the development impacts and potential future sales are limited. There is a limited market for the technology throughout Central America. In December 1986, ICAITI estimated that there were 40 potential clients for this technology; now it estimates only 15. This would mean that over two-thirds of the market is already covered. The evaluation team feels that ICAITI estimates are low and that further market analysis is warranted. Although no direct competition to ICAITI in the field has been identified, it will obviously not be possible for ICAITI to support much of the FWAE personnel with the sale of this technology, even if the market is larger.

ICAITI should streamline the process for developing proposals for technical assistance and establish a system for supervising the entire process, from the original request from a potential client to the completion of the work and evaluation of client satisfaction. ICAITI may be able to increase sales with a specific promotional campaign and modified pricing policies allowing it to recover more cost but over a longer period of time.

2.4.2 Solar Fish Preservation

Some 28 demonstration and other units have been built but not one could be identified that was in regular use. ICAITI has been highly successful in creating an awareness of the technology. An immense interest exists in the technology in national HG organizations and fishing coops despite the fact that the small, demo models promoted by ICAITI have not been responsive to their needs. More work should be done with fisherman in the development and testing of market oriented designs.

Given the great deal of potential and interest, but the lack of an acceptable technological solution to the markets needs, ICAITI should investigate the possibility of developing a more integral project at the national level to further refine and test alternatives with users.

2.4.3 Solar Agricultural Dryers

A large variety of designs have been demonstrated and promoted by ICAITI with some punctual successes. In general, however, a small portion of the units built (20%) are in use. Those that are in use, have often had significant impacts in economic and employment terms. Successes include nearly US$ 1 million in savings in the onion harvest in 1986 in Panama; the establishment of small industries drying fruits which otherwise would have gone unutilized, and dryers for specialized products as diverse as silk worms, herbs and marigolds.

Again, the project was very successful in fulfilling its objectives of increasing awareness and demonstrating the technology. But the demonstration units were small and cheap and not market oriented. Only those with the initiative and imagination necessary to adapt the demonstration models to their needs have been long-term beneficiaries.

Potential demand exists for semi-industrial applications usually combined with combustion or conventional fuels.

An especially great demand and potential for follow-on projects is related to industrial applications for coffee, cocoa, rice (perhaps more so for improved combustion than solar, see below)

2.4.4 Solar Salt Evaporation

This design has clearly been the most successful in terms of fuelwood savings, environmental impacts and the generation of employment and small industries. Although activities relating to the development and promotion of this activity are estimated to represent less than 3% of project outlays, the impacts correspond to over half of the fuelwood conserved, nearly three quarters of the jobs created and a third of the industries created or supported.

ICAITI testing of the technology in Guatemala and collaboration with government programs has resulted in a whole new industry for poor coastal inhabitants. The rapid growth of these industries on the sand dunes along the coast has avoided the necessity to build more traditional systems in-land, where thousands of acres of additional mangroves would have been cleared in order to attain the same level of production. These savings are not considered as fuelwood conserved, but represent significant, positive, environmental impacts. In Honduras, the solar technologies have directly saved significant amounts of fuelwood representing additional portions of mangrove forest.

These positive impacts are expected to continue on a sustainable basis. However, there is still a lot that could be done to accelerate and facilitate the transfer of the technology and growth of these small industries. ICAITI could provide assistance to improve:

- process efficiency (optimal relation between concentrating ponds and crystallization ponds, etc.),
- improved techniques for pond preparation and leveling,
- introduction of improved plastic with qualities necessary for longer useful life in the salineras,
- quality control of the salt, reducing impurities, etc.
- packaging and commercialization of the product,
- appropriate iodization techniques,
- assistance and criteria for selection of equipment and its proper maintenance,
- pumping systems, including the investigation of alternatives to present diesel pumps, including solar and wind sources.

Potential for national follow-on projects definitely exists in Honduras and Guatemala and should be investigated.

ICAITI should learn to run with its successes and define clear limits to investments of resources in technologies which do not produce the desired results.

It is interesting that the solar salt technology, the largest single success of the project, required hardly any promotion beyond the initial demonstrations of the designs. It was clearly a case of having the right idea in the right place at the right time. In such situations, an institution like ICAITI has little influence or control over the dissemination - this technology spread so quickly in Guatemala that there are still no definitive estimates of the number of users, only "minimums" based upon users actually identified, many of whom had no direct contact with any promotional or disseminating agency.

In Honduras, ICAITI's biggest impact was probably a result of the interchange it promoted between small local salt industrialists and Guatemalan counterparts. This inter-change was so beneficial that the Hondurans later contracted one of the Guatemalan contacts introduced by ICAITI to return to Honduras and provide technical assistance in traditional solar salt patios. These have been very successful and have quickly become the predominant mode of production, replacing the cooked salt process that utilized fuelwood. The economics of the black plastic in Honduras relative to the traditional Guatemalan style brick patios are not yet clear (the situation is much different than in Guatemala). This should be further studied before final

recommendations are given to make it clear when - under what circumstances and conditions - the black plastic is advantageous.

All of these aspects should be carefully covered in the final project report.

2.4.5 Solar Hot Water

ICAITI emphasis on project objectives led to low-cost, owner-built design and the publication of a do-it-yourself manual for flat plate construction which are not market oriented. The manual is not complete: it only discusses the construction of the plate collectors and not the rest of the system.

ICAITI has built some demonstration units in public buildings (hospitals) which are problematic for the institute in terms of maintenance. If the long-term costs to ICAITI are calculated, it probably would have been cheaper to use conventional systems.

Solar hot water technology exists and ICAITI is no longer active in the field, although no formal decision to stop activity has been made. Companies that import system components from outside the region have been active in Central America (but how many are presently in business is not known).

2.5 Evaluation of Specific Technologies - Biogas Component

As with nearly all technologies in the original project design, ICAITI has successfully created an awareness of the technology and its designs, and has executed more than the established number of demonstration projects. In total, roughly 80 units have been built and less than half are in use. Potential beneficiaries are, by definition, extremely isolated and hard to reach. Systems are still relatively costly and gas storage remains problematic. Many of the systems ICAITI considers to be "in use" are providing relatively little measurable benefit. Nearly a quarter of the total project resources have been invested in biogas activities, but the benefits in terms of beneficiaries, fuelwood savings, and industries supported, are practically null. Additionally, a whole host of other organizations, private and public, are working in the field and providing technical assistance, often for free. Given this situation, it seems that ICAITI should have removed itself from the biogas sector long ago, with its resources better spent in other areas.

It is recommended that ICAITI get out of the small farm biogas business.

It would be beneficial if ICAITI could fulfill the original project objective to provide a "state of the art" report on biogas development and results of activities in the region by all organizations involved. Considering progress on documenting its own biogas experience, it will need to contract an outside consultant to complete this objective.

The area where there is most likely a role for ICAITI (and a market with resources to pay for services) is with much larger industries than those targeted in the fuelwood project. In these cases, it is likely that there will be a future market for anaerobic digestion and complementary technologies and their application to environmental contamination problems.

2.6 Evaluation of Specific Technologies - Other Technologies Component

2.6.1 Micro-Hydro

Under the "other" heading ICAITI has done some work in micro-hydro development. This was in response to a specific request in Honduras. When ICAITI technicians measured stream flow, they determined that the hydro resource was not sufficient for the demand and the project was not carried out. No further work was done in this area.

Commercial designs exist for micro-hydro as do engineering firms capable of doing the studies and implementation necessary. ICAITI would need to provide special training for its personnel if it were to do significant work in this field. ICAITI must determine if this is an appropriate area for future growth, but at present, further development of projects in this area is not recommended. No immediate sales are likely and it would be preferable to concentrate in the areas where ICAITI has had success and has existing contact with the market, rather than spreading itself still thinner.

2.6.2 "Hybrid" Units

ICAITI has placed in the "other" category all projects which combine applications developed in the previous project components, for example, solar combined with combustion. This is another case of rigid adherence to original project design which split the personnel into three energy base groups: solar, combustion, and biogas. It also reflects the lack of market orientation. The user is not considered, only the energy process. Thus, different engineers worked separately on solar applications for salt production and the combustion applications. The "other" category finally brings these people together to work on some common projects, but still little attention has been given to the market, user and their practices, preferences, etc.

Activities in this component have been more recent and more small industry oriented, and in general, more successful. Potential exists as mentioned above under solar, especially for designs appropriate for the larger regional industries (coffee, cocoa, and lumber kilns, etc.).

2.7 Comparison of Inputs and Benefits of Project Components

Table II-2.4 lists the technologies along with estimates regarding project inputs and their impacts to date as detailed below.

(a) Estimate of project outlay, based upon man-years of project labor invested in each technology (See Table II-2.2). The labor invested is a rough estimate since project labor inputs were only formally controlled by overall component (i.e. combustion, biogas, solar or other). These estimates are made based upon the component total and interviews with project management and staff.

(b) Percent of total number of potential project beneficiaries represented by each technology (See Table II-2.2).

(c) Percent of project total of fuelwood conserved as a result of the actual use of the design.

(d) Percent of total project beneficiaries corresponding to the specific design.

(e) Percent of total small industries benefiting from the project.

(f) Percent of total project sustained employment generated.

As can be observed in Table II-2.4, Project benefits are concentrated in a few specific designs. On the other hand, many technologies have offered negligible impacts. The biogas component, which represents roughly a quarter of project outlays, has been active for the whole life of the project but represents a minimal impact.

Little management decision making and criteria were evident regarding the relationship between the allocation of resources and expected or actual benefits. Perhaps when the potential benefit is very high, eight years of effort is justified, but it should be a well-managed, evolving effort which seeks to continually evaluate why the technology is not being widely accepted and utilized. If the obstacles are insurmountable, there is little reason to continue the high level of investment in dissemination.

Likewise, not enough has been done to take advantage of and optimize the impacts of relatively successful designs. A clear dissemination plan and execution for these could have greatly increased the total project impact.

Table II-2.4
Summary: Comparison of Inputs and Benefits

Models	(a) Proj. Outlay	(b) Pot.Sect. Benef's.	(c) F-Wood Conserv.	(d) Actual Benef's	(e) Indus. Benef's	(f) Employ. Benef's
Combustion:						
Batch Bread Oven	3%	1.0%	.7%	1.0%	9.8%	4.3%
Continuous Bread Oven	3%		.0%	.1%	.7%	.3%
2-Chamber Brick kiln	3%	.1%	.1%	.3%	1.6%	1.7%
Continuous Lime Kiln	2%	.0%	.0%	.0%	.0%	.0%
Low-Cost Ceramic Kiln	1%	.1%	.0%	.1%	1.4%	.0%
Mod.Brazil Charcoal Kiln	1%	.0%	5.1%	.6%	7.5%	2.9%
Portable Charcoal Kiln	2%		.1%	.0%	.2%	.1%
Improved Salt Evap. Stove	1%	.0%	.0%	.0%	.0%	.0%
Crude Sugar Evap. (Bagasse	1%	.0%	.3%	.2%	1.8%	1.2%
Gasifier	1%		.0%	.0%	.0%	.0%
Combustion Subtotals:	18%	1.3%	6.2%	2.4%	23.0%	10.5%
Cook Stoves:						
"Institutional" Stoves	2%	.2%	.4%	1.1%	6.8%	4.3%
Lorena & Similar Designs	9%	97.9%	33.3%	46.2%	2.3%	.6%
Pre-fab. 3-H Ceramic	5%		5.7%	30.4%	20.5%	8.6%
Pre-fab. "Urban" Stoves	1%		.0%	.0%	.0%	.0%
Cook Stove Subtotals:	17%	98.1%	39.4%	77.7%	29.5%	13.5%
Solar						
Lumber Kiln	3%	.0%	.0%	.5%	2.5%	3.2%
Fish Preservation	3%	.2%	.0%	.1%	.0%	.0%
Agric. Dryers	17%	.2%	.3%	.8%	3.0%	2.9%
Salt Evaporation	3%	.0%	53.6%	10.3%	33.4%	69.0%
Water Heating	3%		.0%	7.7%	.0%	.0%
Solar Subtotals:	28%	.3%	53.8%	19.4%	38.9%	75.0%
Biogas:						
Low Cost Digestor	7%	.0%	.0%	.0%	1.1%	.0%
Conventional Digester	11%	.0%	.4%	.2%	6.6%	.1%
Dry Digester	4%	.0%	.0%	.0%	.2%	.0%
Packed Bed	2%	.0%	.0%	.0%	.0%	.0%
Biogas Subtotals:	24%	.1%	.5%	.3%	8.0%	.1%
Others						
Solar/Combust. Dryers	6%	.2%	.1%	.2%	.7%	.9%
Others (not specified)	5%					
Micro-Hidroelectric	1%		.0%	.0%	.0%	.0%
Other Subtotals:	12%	.2%	.1%	.2%	.7%	.9%
TOTALS	100%	100%	100%	100%	100%	100%

2.8 External Factors

Various external factors can influence the viability of FWAE activities in di.ferent countries and regions. The legal framework is one important case. Some countries have passed laws making it illegal to cut trees within specified areas, or of specified species. There are also laws prohibiting the production of charcoal - which makes it more difficult to introduce higher efficiency processes.

Wood availability and price are important factors.

Table II-2.5 shows that:

- wood prices vary greatly from country to country, with El Salvador, as by far, the country with the highest prices.

- wood prices are increasing in all countries, though in Honduras the rate is much lower than the rest, and Guatemala intermediate.

A surprising number of residential fuelwood users may buy their fuel as a study from Guatemala, indicates Table II-2.6. As would be expected, patterns vary significnatly between regions of the country. In general, one will expect greater receptivity to more efficient technology from users who purchase their fuel. As ICAITI's work with residential wood stoves shows, however, there are significant side benefits, which may be sufficiently important to stimulate demand even amoung rural users who collect their wood. Sample benefits are, less smoke, a cleaner cooking area, shorter cooking time, and greater safety (especially for children). Many of those benefits are partiularly felt by women.

TABLE II-2.5
CENTRAL AMERICAN FUELWOOD PRICES IN 1980 & 1987
(US$/cubic meter)

COUNTRY	1980	1987
Guatemala	9.00	13.00
Honduras	6.50	8.00
El Salvador	22.00	40.00
Costa Rica	5.35	10.00
Panama	4.40	7.50

Prepared by ICAITI

TABLE II-2.6
HOUSEHOLD FUELWOOD USE (%)

USE	REGION I	REGION II	REGION III	REGION IV	REGION V	REGION VI	TOTAL
Do Not Use	7.5	11.0	8.3	89.0	29.3	10.3	21.4
Collect Only	41.6	49.9	54.0	0.5	20.5	43.4	38.0
Buy	45.6	34.9	32.4	10.5	47.3	41.0	36.4
Collect and Buy	5.3	4.2	5.3	0.0	3.0	5.3	4.2
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0

2.9 Summary of Specific Recommendations

General:

- ICAITI should review market potential of existing, successful designs on a country-by-country basis. Alternatives should be prioritized by delegations and project management and efforts should be focussed on the development of a limited manageable number of projects which offer highest potential for cost recovering and/or financing of new, follow-on projects by other donors/agencies.

- ICAITI should learn from FWAE experiences and direct similar efforts in the future precisely at the most interested private sector intermediaries.

- ICAITI should improve resource allocations to take advantage of successes, and define clear limits to investments of resources in technologies which do not produce the desired results.

- ICAITI should perform prior market analysis and use participatory "extension" approach in developing any future innovations/technologies.

- ICAITI should streamline the process for developing proposals for technical assistance and establish a system for supervising and quickly executing the entire process, from the original request from a potential client to the completion of the work and evaluation of client satisfaction. This could be part of the operational norms and definitions recommended in Part 4 of this report.

Bread ovens:

- Recall continuous design and all related promotional materials.

- Have El Salvador ICAITI assistant (technician) visit PTR counterparts in Honduras to share information and develop proposal for revised plans and manual for the improved batch bread oven. The proposal should be reviewed, edited and published by ICAITI to replace previous bread technology publications.

- The El Salvador assistant should also review the final reports on the bread ovens being prepared for project closeout. These reports should include objective evaluations of the experiences with the bread ovens.

- Investigate possibility of selling specialized, improved oven designs (which may use conventional fuels) to commercial entities similar to COMAPAN in other countries.

- Continue selling supervisory technical assistance for batch ovens at cost to interested individuals.

Lime kiln:

- Include collaboration with PTR on the development and testing of the improved lime kiln in the package of services to be provided. Also, that ICAITI project personnel study this case as an example of lessons to be learned.

Low-cost ceramic kiln (for stove production):

- Given the large number of small ceramists in Central America, it is recommended that the design be evaluated and documented as part of the project close out process.

Brick kilns:

- Halt promotion of the present ICAITI design.

- Review PTR and other's modifications and results and prepare conclusions on the state of the art improvements in brick kilns. This analysis should become part of the final documentation/report.

- Assess potential for national-level projects to promote most appropriate existing design (this presently would appear to be PTR's one chamber modification of ICAITI design) in conjunction with development agencies and those concerned with forest resources.

Institutional Stove:

- Put more resources into follow-up and evaluation of the many modifications of this stove and document these and the respective conclusions in the final report.

- Look into potential follow-on project financing via third parties and/ or include this as a component of new, urban stove programs. New projects should stress private sector builders and applications.

Domestic Stoves:

- Provide follow-up to evaluate status and interest in stove program throughout region. The evaluation team feels that the urban stove program with its private-sector component offers the highest potential to capture follow-on project funds from other entities and, therefore, ICAITI should identify potential counterparts and sources of funding.

- Since this has been the largest impact component it deserves special attention in the preparation of its final report. Experiences should be widely shared and special emphasis should be given to the trade-offs of owner-built stoves compared to commercially supported ventures.

- ROCAP provide support to ICAITI to identify additional sources of financing for the continuation of the urban stove activities, especially in Guatemala, Honduras and El Salvador.

- ICAITI rush to develop national level projects for the development of commercially marketed stoves.

Lumber kilns:

- More market study and analysis of pricing policies. ICAITI may be able to increase sales with a specific promotional campaign and modified pricing. Give special attention to advertising other services ICAITI could also offer to this sector.

Fish preservation:

- Given the great deal of potential and interest, but the lack of an acceptable technological solution for the market's needs, ICAITI should investigate the possibility of developing a more integral project at the national level to further refine and test alternatives with users.

Biogas:

- It is recommended that ICAITI get out of the small farm biogas business immediately.

Solar Salt:

- ICAITI should investigate the potential for follow-on projects in support of small salt producer industry at national levels in Guatemala and Honduras in coordination with local agencies and governments.

III. IMPLEMENTATION MECHANISMS AND COUNTERPART ORGANIZATIONS

3.1 Basic Roles of ICAITI and Counterpart Institutions

For a technology to go from the laboratory to wide acceptance is a giant step, or better, series of steps. The distance can be particularly long when the new technology must penetrate markets whose characteristics are as relatively poorly understood as the poor urban/rural households and often "informal" small rural industries of the five distinct countries of Central America. At the outset, the Project Paper recognized the importance of "dissemination" and that many other institutions would play a role as "counterparts," some of which should help sustain the dissemination process after FWAE project termination. This section discusses the extension process and ICAITI's relationship with these "counterparts."

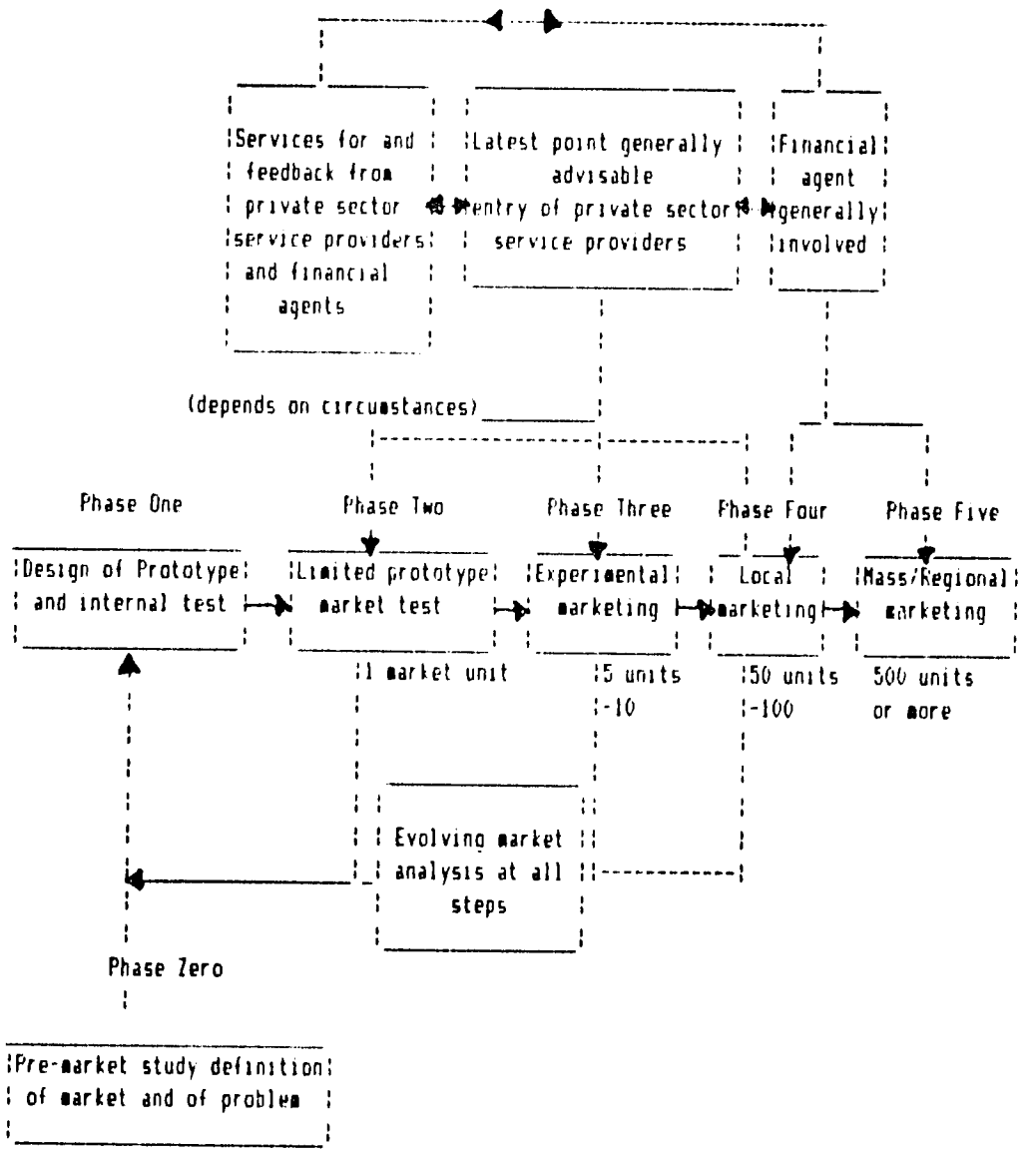
The FWAE Project did not, on the whole, have a clear understanding of and concern for the principles of the extension process. While some individual technologies clearly evolved due to the implementation of a useful extension process (the ceramic stove, for example), such endeavors were not clearly identified and prioritized in project design, and their support appears to be sporadic at best among project management. As a consequence, the weaknesses in the original Project design (see Item 1.4) were not compensated for.

We use the term "extension process" deliberately though it does not figure in project documents. There is a direct analogy with the agricultural extension process. The basic steps of the process are shown in Figure II-3.1.

The first problem arose with the lack of a pre-market study of the needs, interests and trends of the users of the applications for which the technology is being considered. Eventual producers of the technology should also be taken into account. Such study may suggest in some cases that the technology is not indicated, or less indicated than another for the particular market problem it was intended to address. What happened with salt evaporation in Honduras could have been an example. Instead of a more efficient wood-fired evaporator it was decided to go all the way with solar. It should also help in defining design criteria other than energy saving. This pre-market study step was practically non-existent in FWAE.

The next crucial problem in the FWAE extension process came at the prototype test step, somewhat loosely referred to as a "demonstration" step in the Project Paper. "Demonstration" reflects the dominant attitude of FWAE with respect to this step. Instead of treating it as an opportunity to learn about real world bugs or strategic "side benefits" in a lab-tested design, to listen carefully to the market begin talking back; it was taken as a moment to demonstrate a design

FIGURE II-3.1
THE EXTENSION PROCESS



previously determined to be successful by a narrow range of design criteria. If the market didn't react positively, it was the market's fault. If the counterpart made a strategic modification, that modification wasn't part of FWAE. Follow-up on "demonstration" units appears to have been weak. While none of this approach to prototype testing was universal it was disturbingly common and certainly reduced the effectiveness of the Project, including its cost effectiveness.

These first problems in the extension process, due to their seriousness, overshadow the problems of the subsequent steps. One point is clear, however. Passing the prototype perfecting phase does not mean that the technology is ready for rapid dissemination "Scale-up" can present all kinds of problems or highlight problems previously less apparent, and one must consequently be extremely attentive to the market and its reactions.

Penetration of the market by a well-tested technology is a delicate process. It demands increasing attention to the technology service and product providers, who will generally be private sector. In the areas treated by FWAE they will also likely be "informal" sector businesses as well. It also demands increasing attention to financing issues and to establishing linkages between the intermediate "counterpart" groups at the experimental, local, and mass-marketing levels of market penetration. The initiative shown by ICAITI with respect to these three areas and their actors is weak and sporadic.

There have, in fact, been some incipient successes, which show the importance of these factors. They appear, however, to be isolated and no systematic effort has been made to learn from the experiences. This is necessary to implant a marketing methodology which can be adapted to the specific needs of each country.

The importance of private sector providers of goods and services in market penetration cannot be overemphasized, especially when dealing with broad, "informal" markets. Throughout the world it has been shown, repeatedly, in programs of this sort that some actor must make money providing the essential services for the new technology to take root. It is thus critical to identify and work with these actors as early as possible in the extension process -beginning preferably in preparation for the experimental marketing phase- and monitor them as part of the overall and continuing market evaluation. It is in this phase that important bugs, especially those involving broader production/commercialization that may have passed the prototype testing phase, can be detected and corrected. The Lorena to ceramic stove shift is a classic example in this regard. Interestingly, management policy does not reflect the shift. ICAITI simply markets both designs. As with most other aspects of project execution, critical decisions were made by individual technicians, without the support and guidance of, and sometimes in spite of the resistance of, project management.

In the extension process outlined, a key role of ICAITI is and has been that of a technology "gateway" (e.g. Brazilian bee-hive kiln) or developer (e.g. ceramic stove). Starting in the Project Paper ICAITI has also been seen as a "second line" institution stimulating and orchestrating the dissemination of the technologies by front line counterparts who deal more directly with the beneficiaries. While in broad terms these roles appear correct for a regional technical institution, they need clarification to avoid distortions.

First, ICAITI is not the only technology gateway institution. There has been a pronounced tendency to ignore as input to the FWAE extension process technologies or innovation that did not first pass through ICAITI once the Project had begun. This has weakened the benefits which could have been obtained with institutions such as FAO (also working in charcoal) or CDI/PTR.

Second, as should be apparent already, "second-line" does not mean stay out of the field or out of the close contact with what is happening in the market. In the prototype testing and experimental marketing phases especially, field contact must be intense. Also, the field relation in these phases pre-supposes a strong two-way relationship with the counterpart institutions involved. They should not be viewed as passive disseminators, but as institutions which should have superior understanding of local market characteristics, despite ICAITI field involvement, and capable of changing designs (often with local artisan help). Most project relationships appeared to be one-way.

Third, the mandate to orchestrate at least the initial phases of market penetration implies a balance of skills, distinct from that of prototype development, with much less emphasis on engineering. Neither the original Project Paper nor subsequent evolution of the project reflected this point.

3.2 Counterpart Organizations, their Characteristics and Effectiveness of the Relationship

It is clear from the foregoing that the characteristics of the other institutions involved in the extension process will be crucially important to its success. Criteria of selection of these counterpart organizations for specific roles as well as for subsequent management of the relationship are thus vital. Unfortunately, once again neither the Project Paper nor subsequent management seems to have paid much attention to the issues.

The most appropriate counterpart(s) will depend on the phase of the extension process, the beneficiary target group, the profile of institutional capabilities/programs in the country, as well as their own characteristics. It is not possible to generalize as to the type of counterpart which will be most appropriate in all countries.

The types of counterpart institutions which can be involved are extremely diverse, as shown in Table II-3.1, and FWAE has involved most categories. Institution type is likely to affect its internal agenda and capabilities.

The ultimate objective of the extension process is to influence two interrelated groups -"consumers" of the technology and (generally) private sector producers of the technology and accompanying services. Other counterparts are intermediaries in this process. In the testing and early marketing phases especially, it is essential that they understand (or come to understand) and accept the basic rules of the extension process. The FWAE experience has shown that it cannot be assumed that counterparts who walk in the door understand or accept these rules, nor can it be assumed that they will target appropriate consumers and producers, especially in the earlier phases of extension. Unfortunately ICAITI appears to have lacked its own systematic capability to judge whether counterpart choices were appropriate or to have been pre-occupied with assuring that counterparts understood extension (not to mention its own staff).

Acceptance of extension priorities may be powerfully influenced by the internal agendas of counterparts. In some cases, such as with institutions actively concerned with the development process (Whatever their type) or industry associations (e.g. COMAPAN), these internal agendas have led to favorable results. A wider variation in results was found in the case of PVO's.

Once market penetration is well advanced, the criteria on counterpart participation can be relaxed. At that point, they have models to follow, some producer systems ar in place, etc. Difficulties could emerge, especially in the case of domestic stoves, if a counterpart seeks to heavily subsidize overtime the unit's installation, in order to gain "a foot in the door" for other purposes, with a resultant perverse effect on the market for private producer's products.

The list of counterpart organizations which have been involved over the course of the project is very long. Table II-3.2 is a reasonably complete list developed during the evaluation with more than 100 counterparts. A complete list does not exist, but would be longer, since numerous small co-ops, associations and PVO's have been involved. Many are little more than small groups of consumers or "receptors". There is a tremendous range in characteristics and in the way ICAITI would relate to them. Some attempt has been made to build the beginnings of a systematic base, however, this is really an important part of ICAITI's own final evaluation process. Suggestions on this documentation process are presented in Section 3.3.

TABLE II.3-1
TYPES OF POSSIBLE COUNTERPARTS, WITH EXAMPLES FROM FWAE

Government Ministry/Energy Parastatal	-	CEL (El Salvador) MIPPE (Panama)
Institution with Organized Credit Schemes for these Sectors (can also be classified elsewhere)	-	CDI/PTR Honduras
Technical Development and Extension Center	-	CDI/PTR (Honduras CENTA
Major PVO or Foundation	-	(secular): Save the Children
	-	(religious): World Vision
Local PVO or Foundation	-	(secular): "Red Integral"
	-	(religious):
Industry Association or COOP	-	(large):
	-	(small):
Official Regional Development Agency	-	JAPDEVA
Local Technical or Educational Center	-	USAC
Private Sector Provider of Services	-	COMAPAN (El Salvador) Ing. R. Salazar (Costa Rica)
Beneficiary or Consumer Receptor	-	Embotelladora del Atlántico for employees

TABLE II-3.2
FWAE COUNTERPART INSTITUTIONS

A. GOVERNMENTAL INSTITUTIONS

A.1 Guatemala

DIGESA (Dirección General de Servicios Agropecuarios)	Solar drying, biogas, stoves ceramic, water heating
Grupo Nacional de biodigestión	Biogas
ICTA(Instituto de Ciencia y Tecnología Agrícola)	Comb. Drying, solar drying
INTECAP (Instituto Técnico de Capacitacion y Productividad	Biogas, hidro power
CEMAT (Centro Mesoamericano de Tecnología Apropiada)	Biogas, stoves
CREA	Solar drying, stoves
Comité de Reconstrucción Nacional	Kilns
DIGESEPE (Dirección General de Servicios Pecuarios)	Biogas
Ministerio de Salud	Stoves
Centro de Salud, Zona 3	Stoves
INAFOR (Instituto Nacional Forestal)	Kilns, ovens, stoves
BANVI (Banco Nacional de la Vivienda	Ovens
PAAC	Solar evaporation (salt)
Grupo Nacional Energía Solar y Eólica	Solar drying, solar heating

A.2 El Salvador

CENDEPESCA (Centro Nacional de Desarrollo Pesquero)	Solar drying
Dirección General de Juventud	Solar combustion
Ministerio del Interior	Stoves, solar drying, ovens, combustion
PROZONO (Proyecto Zona Norte)	Solar drying, air heating ovens
CENTA (Centro Nacional de Tecnología Agrícola)	Stoves, ovens, biogas, solar heating
Banco de Fomento Agropecuario	Stoves
DIDECO (Dirección de Desarrollo de la Comunidad)	Stoves, solar drying, solar combustion, biogas
Instituto de Vivienda Urbana	Stoves ceramic

Instituto Salvadoreño de Transformación Agraria	Stoves
Ministerio de Agricultura	Ovens bakery
Comisión Ejecutiva del Río Lempa	Biogas
Instituto Salvadoreño de Turismo	Kilns

Honduras

PTR (Programa de Tecnologia Rurales)	Solar, water heating, biogas ovens, cookers
CDI (Centro de Desarrollo Industrial)	Water heating, biogas, kilns Oven

Costa Rica

Grupo Nacional de Biogás	Biogas
JAPDEVA (Junta de Administración Portuaria y Desarrollo Económico de la Vertiente Atlántica)	Oven, solar drying, Comb.
Ministerio de Agricultura	Drying, biogas
Dirección General Forestal	Stoves Kilns

Panama

DIGEDECOM (Dirección General de Desarrollo de la Comunidad)	Stoves
Ministerio de Planificación y Política Económica	Cookers, kilns, stove, biogas
Ministerio de Desarrollon Agropecuario	Solar drying
Unidad de Transferencia de Tecnologia	Solar drying
Banco de Desarrollo	Solar drying

B. PRIVATE VOLUNTEERS ORGANIZATION

B.1 Guatemala

Cuerpo de Paz	Biogas, stove ceramic, water hatchings, salt production Alianza
Desarrollo Juvenil Comunitario	Biogas, stoves ceramic, stoves institutional
Programa Desarrollo Familiar Satélite	Stoves

COGAAT (Comision Guatemalteca Alemana de Alimentos por Trabajo)	Oven, stoves
CARE (Comisión Americana de Remesas al Exterior)	Stoves
Cáritas Adquidiocesana	Oven
Comité Central Menonita	Stoves, ovens
Foster Parent's Plan	Biogas
FUNDACED (Fundación para el Desarrollo)	Stoves
ASECSA	Stoves

B.2 El Salvador

Cáritas Adquidiocesana	Ovens
Plan Padrinos	Stoves
Misión Adventista	Stoves
Visión Mundial	Ovens

B.3 Honduras

OEF International	Biogas
COHAAT (Comisión Hondureña de Alimentos por Trabajo)	Solar drying, stoves

C. NATIONAL AND INTERNATIONAL DEVELOPMENTAL AGENCIES

C.1 Guatemala

FAO (Organización de las Naciones Unidas para la Alimentación y la Agricultura)	Biogas

C.2 El Salvador

AID (Agencia para el Desarrollo Internacional)	Stoves

C.3 Costa Rica

ACNUR (Alto Comisionado de las Naciones Unidas para los Refugiados)	Oven

D. TECHNICAL AND EDUCATIONAL CENTERS

D.1 Guatemala

Centros Regionales Universitarios	Solar drying
Escuela Villalobos Norte	Stoves
Instituto Técnico de Agricultura	Biogas
Comité Pro-construcción de Escuelas	Stoves
Instituto Indígena Santiago	Ovens, biogas
Universidad de San Carlos de Guatemala	Biogas, stoves, dryers

D.2 El Salvador

Universidad Tecnológica de El Salvador	Fish drying
ENA (Escuela Nacional de Agricultura)	Biogas

D.3 Honduras

Universidad Autónoma de Honduras	Solar drying
CURLA	Solar drying,water heating

D.4 Costa Rica

Colegio Universitario de Puntarenas	Solar drying
Universidad de Costa Rica	Solar drying
Universidad Nacional	Solar drying

D.5 Panama

Instituto de Investigación Agropecuaria de Panamá	Solar drying

E.COOPERATIVES

E.1 Guatemala

Cooperativa de Cerámica Nueva Luz, R. L.	Stoves
Cooperativa de Producción Chinautla	Stoves ceramic

E.2 El Salvador

Cooperativa Hacienda Santa Lucía de Orcoyo	Biogas digester
COMAPAN (Cooperativa de	Ovens Panificadores)
Cooperativa San Cristóbal	Ovens

E.3 Costa Rica

Asociación de Mujeres de San Ignacio de Acosta	Oven, stoves
Asociación de Mujeres de Puriscal	Oven, stoves
COOPEPESLA	Fish drying
COOPETALAMANCA (Cooperativa de Pescadores de Talamanca)	Solar Drying

E.4 Panamá

Cooperativa Bocatoreña	Solar drying
COCABO (Cooperativa de Cacao Bocatoreña)	Solar drying

F. PRIVATE ORGANIZATIONS

F.1 Guatemala

CORPINSA	Solar drying Hospital San Vicente de
Paúl	Stoves
La Corona	Solar drying Agroquímicas de
Guatemala	Combustion drying Aserradero
Arathoon	Combustion drying Cementos
Progreso	Kilns Embotelladora del Atlántico
Stoves	
Fábrica de Jabón la Luz	Solar drying
Finca Peña Plata	Stoves, combustion drying
Finca Santa Rita	Combustion drying
Ingenio Santa Ana	Stoves
Asociación de Sal de Sipacate	Salt production
Aserradero Vasconia	Solar drying
Chumen	Solar drying
Talleres Flores	Solar drying

F.2 El Salvador

Panadería Pan de Lys	Oven
Panadería San Vicente	Oven

F.3 Honduras

Aserradero Lardizabal	Solar drying
Centro Médico Hondureño	Oven, water heating
FAMU (Fabrica de Muebles)	Stoves, combustion drying
INDUMA (Industria Maderera)	Solar drying
MADERCO	Solar drying
TROPLY (Tropical Plywood)	Solar drying
Asociación San José Obrero	Water hatchings
Asociación de Salineros de San Lorenzo	Salt production

F.4 Costa Rica

Cabo Rico Yates	Solar drying
Fábrica de Carretas Chaverri	Solar drying
Finca Júpiter	Cacao drying
Finca La Tuba	Cacao drying

As can be seen from Table II-3.2 there has been a clear difference in counterpart strategy in Honduras relative to other countries. Whereas in general the strategy has been to interact directly with dozens of counterparts, in Honduras overall co-ordination of the counterpart role has been assumed by the USAID-financed PTR (Rural Technologies Program) within CDI (Commission for Industrial Development). In Panama, where FWAE involvement was less, there was also some centralization around RENARE and DIGEDECOM. The evaluation team could not visit Panama. Other countries do not appear to have a comparable nation-wide rural technology program of this nature which so neatly parallels ICAITI's FWAE role.

While there were risks in concentrating activities around essentially one national counterpart in Honduras, the results appear to have been relatively satisfactory, especially with regard to the small business sector. Here indeed there's considerable evidence that CDI/PTR understands the nature of the technology extension process better than does ICAITI. Their approach to brick kilns and bread ovens has been exemplary. The fact that CDI/PTR's function parallels ICAITI's in many ways has led at times to friction. On the whole this friction has been creative and would have been more creative if ICAITI's response had been less introverted. As will be indicated later, CDI/PTR should continue to play a key role in any attempt to continue FWAE-derived activities in ICAITI, though not necessarily limit itself to CDI/PTR.

In the other countries visited, the plethora of counterpart institutions raises the question whether the number hasn't been excessive, especially without some more explicit hierarchization and with ICAITI's limited project management skills (a subject which will be repeatedly touched on in this report). On the other hand, this proliferation of counterparts is probably more a result of FWAEProject Design and the lack of a truly nucleating national agent than ICAITI imprudence. The FWAE emphasis on quantitative "output" targets across a broad range of technologies (many of which are far from being proven) combined with a lack of emphasis on market research (to correct the very limited Project Paper market analysis) provides an object lesson in how not to design a project.

One counterpart relationship deserves special mention: that with the Peace Corps. ICAITI provided courses, training and literature to literally hundreds of Peace Corps Volunteers in the region. In Guatemala, the FWAE Project has served as an official Peace Corps counterpart with a whole program of volunteers (presently 19) assigned to the Institute. The Peace Corps found ICAITI to be much more effective as a counterpart than other host-country alternatives and volunteers have rated ICAITI highly during their exit interviews at close of service.

ICAITI has worked indirectly with Peace Corps in Honduras, where PTR serves as a direct counterpart for both ICAITI and Peace Corps. In both Honduras and Costa Rica, volunteers have often come directly to ICAITI for assistance and received a positive response. In all countries with Peace Corps presence, Peace Corps staff and volunteers have been advised of and participated in courses, seminars, trainings, etc. sponsored by the project. Volunteers have been especially effective with the stove programs, and have also been involved with solar, bioges and other combustion technologies. ICAITI has also provided guidance in other areeas, such as materials (block production, earth-fiber-cement roofing materials) water supply and other rural technologies.

The collaboration with Peace Corps has been effective and useful for both institutions. While providing training and guidance to volunteers, ICAITI has received valuable feedback and ideas from the field through volunteer contacts. It would be in the interest of both Peace Corps and ICAITI to identify a mechanism to continue and improve this sort of colaboration.

3.3 Possible Measures and Implications for Sustainability and Activity Continuation

It is very important that ICAITI document and evaluate its experience with counterparts, and the technical extension process. This is important not only to increase (dramatically) the usefulnessof the final evaluation process but to lay a vital basis for possible post-FWAE activities. Elements of a basic data base are suggested in Table II-3.3. As ICAITI moves into this possible next phase, a key institutional skill should be know-how about the types of institutions represented by its FWAE counterparts. Which can help best in initial phases such as prototype testing? Which are effective extensionagents if they have a proven technology? What are key indicators to look for in potential counterparts in new areas (e.g. urban cooking)? It is also crucial that ICAITI understand the extension process, something evidently deficient today at an institutional level.

This documentation process should increase sustainability in two ways. First, in terms of the technologies which have already begun to experience success by helping the counterparts themselves be more effective hereafter. Second, it will help increase sustainability of these activities within ICAITI itself. For example, complementary joint proposals can be made. Some counterparts can even fundICAITI. And, finally, it would help to increase ICAITI effectiveness on projects it can do.

An interesting option would be to put all or most of this work in the Business Development Group which is proposed in Part IV. This is pre-eminently a market-oriented activity.

TABLE II-3.3
BASIC COUNTERPART EVALUATION ITEMS WITH SOME EXAMPLES

Counterpart

Type

Tech development center
PVO - secular
Local industry association

Coverage

National
Regional
Local

Financial

Recipient from 3rd sources
"Autosufficient"
Funding capabilities

Primary Agenda Item(s)

Rural industry development

Primary Target Group(s)

Rural poor bakers of San Salvador, etc.

When First Contact?

Present Status of Contact

Is relationship reasonably good?

Type of Involvement

Was activity continued in FWAE related areas?

Effectivness as an extension agent.
Comments on extension role

Future plans in FWAE and small business areas (when available)

Cost recovery by ICAITI from "receptors," be they producers or consumers, does not appear to be an important factor for "sustainability" either in terms of the technologies or the continuity of activities within ICAITI. A serious effort in this direction could bring more head-aches than money. An exception could be where ICAITI does direct technical assistance for some agro- or industrial beneficiaries (such as lumber kilns). This may be necessary in some cases to encourage eventual private sector service provision. Indeed in the case of lumber kilns ICAITI is behaving very much like aprivate agent. On the one hand laudable, on the other, it raises questions about the technology transfer which was a goal of FWAE. Initially the users of these lumber kilns got the technical assistance free with the understanding that they would allow visitors to see the kiln working and thus assist in the demonstration effect. There was also some cost sharing in these initial efforts with some of the firms/users paying for the cost of the kiln materials. Future cost recovery to also include the technical assistance may require flexibility in the payment scheme. For example such a scheme maydelay payments until the kiln is working and allow full payment to be made over a period of time. Also having trained p[illegible] in this technology, private individuals could be encouraged to become suppliers of such technical assistance; such private interest would only do so for a fee (as in the case of such assistance for charcoal kiln construction).

The cost recovery situation should also be distinct with some counterpart organizations. However, no attempt at cost-recovery for services should be made until there is the basis of an evaluation of the type described just above for market analysis.

Counterpart organizations are not well co-ordinated among themselves. At present, it would be possible without ICAITI for a technology to have taken root in El Salvador but not go to Honduras -not even be seriously tested as a prototype in Honduras, despite excellent prospects. It should be stressed that ICAITI has played a useful "regional" role in this regard: highly successful blackplastic solar salt from Costa Rica to Guatemala; conventional solar patios from Guatemala to Honduras; panela-bagasse systems from Guatemala to Panama; Lorena, ceramic and institutional stoves throughout the region. The final documentation process for FWAE should help significantly in this regard. It could be assisted by a review seminar, funded by ROCAP early next year and attended by some counterparts. Some of the more important counterparts (starting with CDI/PTR in Honduras) should also participate in actively reviewing the FWAE final evaluation draft.

Other management issues related to FWAE will be discussed in the following section.

IV. ADMINISTRATION AND MANAGEMENT

4.1 General Considerations

The first key management problem of FWAE has been the lack of market orientation, part of a wider problem that permeates ICAITI. The lack of market orientation was directly reflected in:

- The evident lack of understanding of the extension process, some symptoms of which were discussed in the previous chapter. Directly related management issues are raised in 4.2,

- A systematic depreciation of market analysis and research. ICAITI itself was mostly responsible for the market analysis on which the original FWAE Project Paper was based and should have been intimately aware of its limitations. Yet no deeper overall market analysis was ever subsequently done nor was the systematic on-going market analysis/follow up work so essential to the extension process for individual technologies.

- While controversy exists between HD and delegations regarding the amount and type of authority actually granted to delegations under the project, the evaluation team found that the decision-making was too centralized and should have more systematically involved the delegates who are much closer to the market. Too much weight has been given to the technicians and decision makers tat ICAITI HQ in FWAE. An example of this is the situation with the bread oven technologies. Since 1985, ICAITI HQ has insisted on promoting only the newer "continuous" design and has not supported delegation efforts to improve and document (with a revised manual) a modified batch design. The market has completely rejected the continuous design - a fact which appears to an outsider to have been obvious for two years. The delegates have been resistant to the continuous design because of this. Yet HQ continued (at the time of the evaluation) to only promote the continuous design. The evaluation team visited continuous design "beneficiaries" and feels that ICAITI is making a serious error. Such errors could be avoided with better market orientation.

Lack of market orientation in management is such a basic flaw that it vitiates everything in a project like FWAE, and almost any problem can ultimately be related to it. However, for convenience, we shall consider some additional internal issues.

- There is inadequate basic project management. Record-keeping and documentation are poor, making it difficult to develop an overall vision of the project. While there is some breakdown of costs into project components, there are so many

technologies in each component that analysis of the cost effectiveness of individual technology programs is seriously restricted. This is an exercise that appears not to have been done in any case. There is a lack of clear criteria for decisions on most everything, from selecting beneficiaries to evaluating prototypes.

- Closely related to the above inadequacy, has been excessive independence of technicians, with results depending greatly on their individual qualities. A more organized group review process was finally introduced in 1986. However this improvement appears to have been largely vitiated by a climate of poor communication.

- Practically no organized attempt was made by Project Management to define the transition process to post-FWAE condition: how to convert projects into client services where possible; develop new carry-on projects; or how to convert some project elements into self-sustaining development processes through beneficiaries, counterparts or private sector service providers (whether or not they be counterparts). Performance over the past year on achieving a reasonable FWAE termination has been lamentable. Section 4.3 treats these issues in more detail, as does Section 5.

- Despite a clear commitment during the 1984 extension analysis for frequent field visits on the part of the project manager, such visits did not take place with the necessary frequency to maintain the intended first hand market knowledge. The effect of this is particularly unfortunate in the context of centralization referred to above.

- There has been a passive acceptance of Project Paper predefined outputs and traditional AID "body counts". Instead of questioning them based on sound evolving market analysis and technology evaluation, and using opportunities to make its case, management chose the opposite road. For example, although many observations made in the 1982 VITA evaluation appear valid still today it appears that little attention was given to making the recommended corrections at that time and the present project manager indicated that he had never read the report. The VITA evaluation could have been used in a constructive way to correct some of the project paper deficiencies.

- This situation regarding outputs was complicated by the highly optimistic assessment of the status of technologies for dissemination which was made by ICAITI in preparation for the project extension of 1985. This resulted in an ev[illegible] greater distance between the formal indicators of performan[illegible] their relevance to project necessities. The scheduled 1985 post-extension evaluation, which might have helped correct this discrepancy in a timely manner, never happened.

4.2 Project Management of Counterpart Relationship

Management of the counterpart relationship has been inadequate. As already noted, the problems frequently began with the Project design. However, much has been learned in the world since 1979 about the extension of small-scale energy projects of this nature. It is lamentable that project management has made so little effort to challenge weaknesses in design. Indeed the project extension experience suggests that project management was quite accepting of many of these weaknesses in design.

The general lack of acceptance of field input has been commented on. It appears that only as recent as 1986 were some positive steps taken to limit individual engineers' control of the decision ofwhether or not to incorporate field changes.

Documentation and analysis of the counterpart and beneficiary relation has been inadequate. There's not a complete list of counterparts, at least no such list was available to the evaluation team, which had to request a new informal survey. For seven months in 1985 a limited attempt was made to document contacts outside of ICAITI. Some 400 contacts were registered with more than 150 organizations (excluding multiple contacts in Seminars, etc.), which shows the intensity of this activity and the consequent management need to not get lost in the maze. This simple monitoring process was suppressed and nothing put in its place. The delay in monitoring activity was a mistake. Stopping the activity, once finally underway, only made things worse. Problems were further compounded by the fact that delegate reports were simply buried or lost due to a lack of an organized filing and document control system.

On the other side of this coin, there was no systematic information/follow-up to keep counterparts abreast of new developments in technologies or their modifications and problems in the market place. For example, a recipient of ICAITI information and training in Honduras related to biogas was not aware of the improvements in design that ICAITI has made. Their most recent contact was 1984 or 1985 and they assumed that nothing had changed since then. Not surprisingly, counterparts are mostly uninformed about the wider range of ICAITI capabilities. As in PEEIR no attempt was made to explore technical assistance beyond narrow project limits.

There was no attempt to develop careful institutional criteria for selection of counterparts or how to deal with them.

4.3 1987 Project Execution

The 1987 Work Plan presented to ROCAP was the most complete and analytical project document prepared to date. In it, ICAITI recognized the need for change and planned the following:

- Make formal charges for technical services according to established fees and pricing schedules (throughout the year).

- Identify systems to facilitate income generation by Project activities.

- Prepare final reports on each technology investigated (30 final drafts should have been complete by August 3).

- Reorganize project personnel at the outset of the year to reflect the emphasis on documentation, transferring staff to the components with the greatest documentation requirements.

- Contract outside assistance to assist with the documentation process (May).

- Prepare promotional materials and programs for ICAITI services related to FWAE (20 documents were projected, 13 of which should have been in final by the end of July).

- Establish personnel incentives to maintain morale and productivity.

- Reductions in project personnel, from 26 to 16 by August (primarily by taking Delegation representatives off project payroll), and to 14 by the end of the year.

- Prepare 11 training modules and test their marketability.

- Perform final improvements, modifications and tests on 13 technologies (9 of which should have been completed by mid-August).

Execution of these activities is seriously behind schedule or non-existent. Of the 30 technical reports which should have been in final draft form by August 3, less than half had reached first draft status. No personnel reorganization has taken place to support the documentation effort. Nor have the outside consultants been contracted.

No personnel incentives have been established. The planned reductions in personnel are not actively being considered or planned for.

Preparation and marketing of training modules: one out of 11 completed. Testing and modification of many technologies are being planned in detail; their implementation is intended to be started once the principal FWAE reports are finished.

4.4 Basic Conclusions on Management

On the whole the quality of FWAE project management appears to have been a negative factor in attaining project goals, both at the levels of application of basic principles and of detailed day-to-day operations (e.g. poor record keeping). There appears to have been little ability or predisposition to learn from successes and failures or even to accurately identify them.

Unquestionably FWAE is a difficult and complex project to manage, especially from an institutional point of view. The project also involved a wide range of skills. Unfortunately these obvious points were never integrated into project management, having been lost due to the predominantly engineering focus of the staff. Because of this technical focus, both training and development, and management strategy also suffered.

As is clear from preceding commentaries and items 5.1 and 5.2 below, the situation has been allowed to drift with problems accumulating and time running out. If this situation is not corrected, the sustainability of several FWAE activities could be unnecessarily put in jeopardy.

Senior ICAITI management has stated to the team its commitment to trying to achieve such sustainability. It thus appears that the first step towards recovering the situation, about which some ideas are offered in Section 5, must be an immediate overhaul of project management together with definition of strategic priorities. The nature of this reform could be the first test of whether ICAITI can effectively confront the difficult transition challenges outlined in Parts 4 and 5 of this report.

V. TRANSITION TO POST-FWAE ACTIVITIES

5.1 The Current Situation

If no immediate and significant changes are made in project organization and management, ICAITI's FWAE Project will continue on its present course for the rest of the year. Probable outcomes as of PACD and in early 1988 include:

- Lack of adequate project documentation for final reports.
- No major promotional campaigns executed, minimal demand for project services.
- Minimal or no project income to maintain personnel, necessitating drastic cuts. Process would probably start with reductions of delegation staff and loss of best personnel due to self-attrition.
- ICAITI maintains a core project group, but soon realizes that the sporadic sale of FWAE related services cannot justify their long-term support. The only area where it is able to recover most of its costs is lumber drying, but this is not sufficient to support even delegate assistants.
- If new, follow-on projects do not land on ICAITI's lap, FWAE related activities will probably eventually be phased out completely and any personnel which is kept on would be absorbed by other projects and activities.
- New project activity in El Salvador could create significant administrative demands on the Institute, but it will do little to alleviate the personnel problem the Institute feels concerning FWAE, since the El Salvador project (as proposed) will require, almost exclusively, full-time personnel in El Salvador with different skills than those presently evident in the majority of FWAE staff.

The above may be called the "business-as-usual" option.

To avoid the realization of this option by default, the evaluation team strongly recommends that actions be taken immediately to reorganize project personnel, and to improve market-orientation, management and productivity.

5.2 Near Term Actions for a Positive Transition

In general, personnel mix in Technical Services Division must become stronger in management and marketing areas. The need for new personnel with strong private sector experience, management and marketing skills, is foreseen.

Reductions in present staffing levels will be necessary and should be based upon a review of demonstrated performance and skills. Numbers should be reduced while quality and productivity should be increased. There are dedicated valuable personnel who should be kept on and given increased incentives. Many of these individuals are responsible for the progress the Institute has made to date in identifying follow-on projects. The evaluation team feels it would be useful and appropriate for delegates to participate in a review of the performance of personnel which directly support the delegation and which regularly travel to perform activities in their country.

The lessons from experience summarized in Section 6 should be considered and applied to all future activities and projects. Specific activities recommended for immediate implementation follow. Personnel should be reorganized into functional groups based upon highest priorities such as:

A. Documentation

Utilize best writers and personnel capable of self-evaluation and analytical synthesis. Complement with local consultants/contractors. Give priority to technologies targeted for commercial promotion and sales. These activities should obviously be executed as soon as possible, before PACD, and with project resources.

B. Promotion and Sales of Marketable Services

(1) Small industry & commercial applications (lumber, brick, bread)

Need to begin with analysis of market, overall needs and interests of users, review of past customer satisfactions, suggestions for improvements. Delegates and assistants must be principal actors. Market surveys, etc., will require additional time and resources, which the evaluation team recommends be included in the PEEIR extension under business development and marketing in Parts 4 and 5.

Based on market in each country and providing maximum flexibility and delegation of authority to Delegates: establish and execute promotional plan; test pricing policies for 100% cost recovery; establish fast and efficient administrative and accounting procedures for signing contracts, providing services, evaluating customer satisfaction, and recovering fees.

Pricing policies may be the critical element in determining sales and ability to recover costs. Shared-savings and other innovative policies may be necessary and should be considered.

Maximize in-house capacity (delegate staff) for providing services wherever demand warrants.

Concentrate efforts on few time-tested, successful technologies (lumber kiln and perhaps modified batch bread oven for starters from FWAE, perhaps others from other projects/divisions) which offer potential to generate immediate cash flows and have high potential for full cost recovery.

Bring in outside assistance for promotional campaigns (advertising) as deemed necessary, but ensure that administrative and service capacities are appropriate for response.

(2) Courses/Training

ICAITI has a series of training modules which already exist and could be modified or updated according to market needs identified.

Similar to (1) above, analysis of the market is crucial first step. Who is the market? At present, primarily other development organizations. What training needs exist for which ICAITI has a competitive advantage? What do past participants suggest? What market exists for present training capabilities (cookstoves, solar applications, small industries/combustion, etc.)? What is market willing to pay? Can costs be recovered? Delegates and assistants must participate in the market analysis.

Further development will depend upon market analysis. It is probable that principal market will reflect priorities and needs of development organizations and existing bi-lateral programs. Most likely candidates appear to be training programs aimed at stove construction and marketing (ceramic stoves), and informal sector development.

As in B(1) above, the resources for the market analyses would probably have to come out of the PEEIR extension.

C. New Project Development

- Complete list of potential new projects, select and prioritize those which best fit Institute goals, resources and strategy, and assign responsibility for their systematic development and review.

- Establish systems for project identification, concept review, development with host country counterparts, internal review, standard financial policies on costing, overhead and pricing, clear definition of review process -go/no-go decisions (who and when), etc. Recent proposal development has been very time consuming.

- Given the constraints and the difficulties in marketing experienced until now, it would be wise not to disperse proposal development over too many possibilities. Indeed, in the longer term work should be more focused than was the case of the FWAE.

- Re-establish Technical Services Division Management with market-oriented, experienced manager. To successfully realize the activities noted above, active, dedicated and efficient STI management must be restored. Outside personnel will be necessary to increase STI management capacity in order to properly carry out existing and new projects and priorities.

- Increase delegation personnel, to allow active participation of Delegates and assistants in activities B and C above. In general, it is proposed that some increase in ICAITI in-country representation, even with a parallel reduction in Guatemala staff if necessary, would be a healthy change for the institute and support a stronger market orientation.

- A majority of the new project development activities listed above will require the broad institutional/organizational support the evaluation team recommends as detailed in Part 5 of this report.

The evident shortage of resources available for the above activities, despite recommendations made concerning PEEIR extension support for business development support, means that management must be continually attentive to overall priorities, including those between the sets of activities in A, B, and C. A "triage strategy" eliminating or deeply cutting some lower priority or longer term return activities may unfortunately be necessary.

5.3 New Project or Service Development Areas

If it is the team's view that potential projects exist with funding orservice activities to carry on from the base created by FWAE. To develop these possibilities, which it appears management largely doubts, will require a more positive perception planning and preparation to go after the market in an efficient and organized manner.

Some possibilities which have been identified by ICAITI thusfar are briefly discussed below. They are a preliminary list for the new project development process. They and others which may emerge will have to undergo a process of prioritization, first, in the near term, but also in the medium term. Some promising areas may simply require more time to reach approval.

5.3.1 Informal Sector Support (AID-El Salvador)

A project of this sort in El Salvador is the most advanced and most likely to come on line quickly. It is a positive step to get ICAITI in the competition for more bi-lateral project funding. It will also force the Institute to adapt to the administrative consequences of responding to this more decentralized market.

The success of the first project with a bi-lateral AID Mission will probably be very influential in obtaining additional funds from USAIDs. Therefore, ICAITI should carefully analyze its proposal and ensure that it has the technical, logistic, field, managerial and administrative capacity to fulfill the proposed objectives.

Experience with FWAE suggests that management and ICAITI-Delegation communications/coordination are potential weaknesses. The fact that no undertaking of this scope has been done before by ICAITI on a bi-lateral basis is also cause for concern and suggests a need to carefully plan and establish a flexible and dynamic project management.

ICAITI's comparative advantage as a front line field organization working with micro-enterprises and individuals in rural areas has not been clearly demonstrated in the past. Even less so when the areas in question are potentially part of the active civil conflict in El Salvador. While direct contact with the market and beneficiaries is always necessary, ICAITI should consider concentrating efforts as a "second-line" organization, providing the necessary support to the agencies already active on the front lines.

5.3.2 Commercial "Urban" Stoves Projects (Guatemala, Honduras, El Salvador)

The stove component offers by far the largest potential for socio-economic impact. It has already had the most impact in terms of beneficiaries of the FWAE Project. ICAITI has a comparative advantage in this field. It has the best lab, most experienced staff, and is the only institution actively developing commercially oriented activities. Many international organizations should be interested in supporting these activities (GTZ, SIDA) and there is also in-country interest. Extension counterparts will in most cases be different than in previous rural stove work, and must be identified. Fuel supply issues may also have to be considered, (e. g. charcoal, even compressed bagasse) depending on the scope of work. A step by step approach may be advisable depending on donor interest. One might first try to commercialize a more efficient wood stove. Eventually ICAITI might participate as a technical component in a sectorial and policy oriented study on all cooking fuels for the urban poor. This is a sector where policy is confused throughout Latin America and begs for high level donor attention in several Central American countries.

5.3.3 PTR/CDI Follow-on Projects

The relationship developed with PTR/CDI in Honduras has been highly beneficial to both institutions. The benefits will be even greater if more attention is given to PTR feedback and suggestions based upon field work.

PTR is interested in continuing the relationship, but time is running out. ICAITI should assign personnel to develop a mutually agreeable mechanism for the continuation of support services to PTR. ICAITI will need to spearhead the efforts to reach an agreement and prepare a proposal for joint presentation to AID and perhaps other funding sources. PTR continues to develop new technologies in energy and other fields. ICAITI could facilitate the process in PTR and also increase benefits by sharing results with the appropriate commercial sectors in other countries.

CDI is interested in developing and supporting a large array of small enterprises (+/- 40), many of which are in present ICAITI areas of expertise (food technology, packaging, use of sub-products, etc.) though mostly unrelated to prior FWAE work. ICAITI support for these activities would undoubtedly be beneficial to CDI. The possibility of including this support in the PTR package or negotiating a separate proposal should be investigated.

5.3.4 Technical Assistance for Private Sector Programs (Honduras, El Salvador and Guatemala)

"Private sector programs" are a dynamic and to some extent distinct element in bilateral USAID portfolios throughout the region as well as in those of some other donors, including PVO's. These programs have a strong but not exclusive "non-traditional export" emphasis and generally include a component of support to small and micro-businesses and the informal sector. The programs are generating a demand for technical assistance for adaptive process development, and other needs, among entepreneurs of various sizes. This demand is of general interest to the Technical Services Division and could include elements that use skills developed during FWAE.

5.3.5 Technical Assistance and Training for Peace Corps Programs in the Region (Guatemala, Honduras, Costa Rica, Dominican Republic, and Belize)

As noted previously, Peace Corps and ICAITI have established a mutually beneficial relationship through the FWAE Project. However, only a small fraction of the full potential for such a relationship has been realized. ICAITI could be doing much more to provide training and technical support services to Peace Corps programs in the region. These opportunities have not been seriously analyzed. In Honduras, the

evaluation team spoke with the Peace Corps Director and found that potential areas of collaboration exist in four different PC Programs: Rural Development (including appropriate technology), Community Services (including small businesses), Natural Resources (including forest resources), and Agriculture (including small agro-industries). Similar opportunities exist in other countries in the region.

Other projects may be identified according to Instituteprioritiies and delegation input. The possibilities appearendless. Prioritization and clear institutional focus will be necessary to avoid over-extension and dispersion of effort. The Delegates and their assistants are in the best position to assess potential markets and availability of funds.

In Table II-5.1 a list of additional potential follow-on projects is presented. The list is by no means meant to be exhaustive. It was developed based upon only a few, brief interviews with persons in the field. The aim is to list a number of potential activities identified by delegates, assistants and counterparts, where it is believed there is potential and interest on the part of the counterpart for further investigation and project development. For some of these, ICAITI already has proposals prepared or in process.

A review of the opportunities above suggests the following broad points.

The transition from FWAE is based as much on its characteristics as a small business informal sector project as on its characteristics as an energy project. The extent to which this can be built on will depend heavily on the extent to which the institutional experience in technology extension can be incorporated and developed.

To some extent the changes in the profile of possible post-FWAE activities with small business parallels the changes recommended in PEEIR, with a narrower industrial energy focus expanding to a broader process focus. The analogy with salt producers here is very clear. The difference is the size of the firms. The potential for a more integrated treatment of PEEIR AND FWAE-type activities thus exists.

Finally, it will be necessary in the marketing effort to take a posture more open to collaboration with other institutions in the region, including joint proposals. This may be critical for obtaining funds at the national level, but this will require changing some old habits.

TABLE II-5.1
ADDITIONAL POTENTIAL SERVICES - BY COUNTRY

HONDURAS	
- COHEDFOR	Specific fuelwood projects.
- Ag. Research Lab (FIAH)	Possible support and complementary role.
- OEF International	Interest in small industries.
- RR.NN.	Interest in biogas and wood energy resources.
- FAO	Specific interests in equipment for biogas utilization (lamps)
- PTR	Integral support to small salt producers, etc.
- DIFOCOOP/Univ./others:	Integral support to artisan fishing industry.
- Project for energy use by small coffee producers.	
- Productive stoves and ovens for cassava processing along Atlantic.	
COSTA RICA	
- Japdeva	Integral small fisherman project.
	Charcoal production project
	Coffee and Cocoa processing
- Red Cross	Stoves in refugee camps
- Banana Association	Dryer and processing of products
- Construction industry (bricks/tiles):	Reduce costs of production.
- Pvt. Sector lumber kilns and follow on services:	Plant lay-out
	Fine wood finishing, etc.
- CIDA	Interest in solar combustion dryers
- Cocoa industry	Very large potential market of national interest.
GUATEMALA	
- INAFOR	Urban Stoves
- Min. Agric.	AT development
- AID	Productivity
- DIGESA	Stoves
- PVOs	Stoves
- Support and Develop. of national small ceramist industry.	
EL SALVADOR	
- CEL	Charcoal
	Alternative fuels and brickettes
	Stoves
	Brick and lime kilns
	General fuelwood projects
- PVO's	Stoves
	TA with small enterprises
- COMAPAN and others	Ovens
- CENDEPESCA or others	Integral fish project.
- AID	Displaced persons.

5.4 Cost Recovery and Self Sustainability for Fuelwood and Renewable Energy Activities

Cost recovery and the need to have some degree of self sustaining financing is an important issue for both the fuelwood/renewable energy and energy efficiency USAID sponsored projec ? at ICAITI. There are important differences in the nature of the problem when viewed from the differing perspectives of the two projects, but in general there is missing a well thought out and developed pricing and cost recovery set of policies and implementing procedures. The evaluation team strongly recommends the development of such a set of policies. The discussion below outlines some of the teams findings and initial thoughts that could be reflected in such policies.

5.4.1 Need for Alternative Policies for Differing Classes of Beneficiaries

The pricing of ICAITI services must reflect the differences between groups of beneficiaries regarding both the capacity to pay and willingness to pay. Current policy does not explicitly consider these issues. The current policy might generally be characterized as one of cost sharing; direct beneficiaries of intermediaries (such as other government or NGO programs) pay for materials, while the technical assistance is subsidized by the project. In addition, the direct beneficiaries must be willingto show others the demonstration, allow visitors, etc., and hence serve as part of the demonstration/diffusion process.

Industrial firms or small but commercially oriented cooperatives receiving ICAITI assistance for such technologies as solar drying will often have the capacity to pay the full cost of the service/technology implementation but exhibit anunwillingness to pay. The later may stem from the view of industrialists wanting to see results before paying, or an association of the assistance with "government programs" and a reluctance to pay for assistance they perceive can be had for free. Policies can be devised, as discussed below, to overcome these sources of unwillingness to pay. However, the latter perception can be difficult to overcome particularly as in the current programs when all early assistance was given for free andthere was no formal policy that this would change over timegiving way to a policy on increasing cost recovery.

In contrast, for many beneficiaries such as poorer groups or households who might benefit from such technologies as improved stoves or agricultural drying the ability to pay the full cost including the real cost of the technical assistance may be quite limited. This may also be the case for potential beneficiaries of various training activities. And in such cases there may be justifiable social objectives warranting some degree of cost subsidy, there remains the question of "what should be the subsidy policy and where should the subsidy come from". This latter question must be a focus of any pricing/cost recovery policy formulation policy and an important aspect is discussed immediately below.

5.4.2 Cost Recovery and/or Cost Sharing From non Beneficiaries

If the type of activities supported under the fuelwood and renewable energy project warrant continuing support, (and in the evaluation teams judgement this is the case), there remain the questions of how to support these activities, and to what degree there should be a continuing ICAITI role. If one were to ignore for the moment the latter question and assume that even though there has been considerable development of local capability in this area, it would still appear there remains some role of ICAITI, but little or no ICAITI budget to allow subsidization of the delivery of technical assistance. The policy issue becomes whether to pursue greater cost sharing from other non ICAITI budgets, and how to increase the proportion, while getting ICAITI services to be reimbursed by other agencies. If the services are beneficial, they should be so viewed by other development agencies. And if the ICAITI services are still needed due to a lack or scarcity of local skills, other institutions should be willing to provide cost sharing and some financing for ICAITI's services and ICAITIshould be actively seeking such financing. At a small scale, an example of such an approach is the Costa Rica delegation's work with the government agency SINECOOP, which provides some of the monies for materials in the demonstrations. Greater cost sharing could be achieved by moving both actual and in kind cost sharing to SINECOOP (letting them do more of the workshop organizing, training them to do most or all of the teaching and demonstrating themselves) and getting them to put some support for ICAITI in their budget so as to pay for ICAITI services. Similar possibilities exist in other countries.

Even with lower income beneficiaries there may be opportunities for them to pay for a significant part of the total cost if flexible pricing/cost recovery mechanisms are utilized.

5.4.3 The Need for Flexible and Innovative Pricing/Cost Recovery Policies

At the extreme, every beneficiary has a different capacity and willingness to pay. And while it would be administratively difficult to devise policies that treat every case separately there is much to be said to developing a pricing and cost recovery policy that provides, within guidelines, a reasonable degree of pricing/cost recovery autonomy to the individual delegations. These delegations are the staff closest to the market, and if the guidelines indicate cost recovery targets, they should know better what pricing approach to best tailor to a particular beneficiary (or intermediary institution). This need for flexibility is relevant not just to the fuelwood and renewable energy activities (as the discussion in Part 3 indicates). Amongst the possibilities that should be examined in the development of such a flexible pricing policy are the following:

- Time payment schemes rather than initial up front payments, fees over time based on business, etc.; or,

- Shared savings or royalty type schemes;

- An alternative in the case of the use of new technology introduced by "using local businessman model (see /// below)"; perhaps commission on sale of a businessman's service if ICAITI promotes him;

- Higher commissions, or some royalty, if ICAITI is the source of knowledge or technology and the recipient business does not pay the full cost.

In any of these cases, the costs of administration must also be considered. For small, low-cost technologies (such as stoves, perhaps bread ovens), the costs of administering and collecting revenues in these schemes will probably be much greater than the revenue collected. In these cases, the only alternative is to justify the investments necessary to transfer the technologies to self-sustaining, private sector actors, and to look for organizations willing to finance the development and transfer efforts based upon the social justifications. ROCAP may be influential in assisting ICAITI in capturing such projects from other sources.

5.5 Documentation Needs for FWAE Termination and Transition

The documentation process presently underway is an important part of the last phase of FWAE. It has been marked both by considerable internal discussion since January as to what its scope and content should be, and by substantial delays.

As noted, this documentation is crucial for the continuation of key past-FWAE activities. We believe that the documentation process should be evaluated primarily in terms of its role in the overall effort to achieve a transition to continued key FWAE-related activities, both within and outside ICAITI. Given this position, the team makes the following observations:

(a) This is too great a focus on technology and individual technologies. Each technology (there are about 30) is being written-up around an outline with the potential to be quite demanding in effort, and which appears to be weak in analysis of the extension/institutional experience. While there is evidently a case for systematic write-up of all technologies, it may be more realistic to treat many of the less important or successful technologies in a much more simplified way. This is especially the case if outside consulting/writing skills are to be contracted -as is proposed- to help strengthen/accelerate the documentation process. There appear to us to be higher priority uses (i.e. new project proposals) for scarce ICAITI resources, especially writing talent.

This observation does not mean that unsuccessful attempts at dissemination should be ignored. There are "lessons" to be learned from these activities as well, which are important to document. In this case, the use of outside talent to analyze the experiences objectively will probably be required.

(b) A comprehensive view of the project is required, which emphasizes an evaluation of the extension process. Which technologies were successes or failures? What factors contributed to success or failure? Were changes required (technical, institution or in commercialization strategies) to achieve success - where did the impulse originate? Were some failures more institutional than technological (e.g. lime-kilns)? Can we draw methodological conclusions regarding the steps from market-research to design, testing and market penetration? These types of analyses and comparisons should be clearly presented in the overall component reports and final project report now programmed (but for which no format has yet been prepared). These documents should be useful both for ICAITI and other institutions whether or not they have been counterparts. They should build both from the documentation in (a) and the analysis of counterpart relations discussed in 3.3. The documentation in (a) should include more institutional/process information and analysis than it now does -even in the cases where overall simplification is recommended.

(c) Somewhat paralleling the above there should be a strategic planning effort that seeks to identify energy technologies or market areas as priority targets for future activity, together with indications of specific targets, possible funding sources (if not with direct beneficiary cost recovery) and counterparts. This documentation represents, in effect an early part of a "business development" process that should be regarded as continuous (see Part 4). This report has sought to contribute in the direction both of (b) and (c), but has lacked as input information and basic analyses that these exercises need. It is in these two areas especially that external writing/analysis capabilities should be contracted.

(d) The current documentation effort appears to be perceived as a strictly in-house effort, conducted almost totally by the technician responsible for the development of the design and its demonstration. No counterpart review, feedback or active input is contemplated. This approach perpetuates the introverted posture criticized both by VITA and this evaluation. Several counterparts have had an important technical design impact in successes and doubtless many others have useful contributions to make concerning extension, consumer acceptance and the involvement of private sector providers of services usually necessary to achieve success. It is recommended that in the documentation described in (a) and (b), there be a serious review possibility opened to the more relevant and important counterparts (such as PTR) and the delegations.

Given limitations of time for report preparation, it is necessary to look for ways to include this review without greater delays than those already caused by ICAITI. One possibility would be to bring the most important experts together in one location for a day to concentrate fully on the review of a particular technology/report and thereby gather relevant comments in a matter of 24-48 hours.

This can both discipline and enrich documentation, making it more representative of the FWAE experience as a whole (even excluding fuelwood production). Although disagreements may surface, the overall effect of this documentation effort should strengthen counterpart relations.

(e) Resources for new or updated manuals and other extension/dissemination materials (such as a simple illustrated sheet or brochure on ceramic stove use and installation) should be concentrated only on those technologies that have already shown some degree of consumer acceptance. The FWAE budget to end of year is tight and resources can be better used than for the production of manuals for technologies that have not at least successfully entered the "experimental marketing" phase (see Figure II-3.1). Historically, ICAITI has tended to overproduce written dissemination materials (also in PEEIR). In FWAE it seems that the most successful designs lack appropriate dissemination materials, while some designs which should not have been promoted, abound in promotional documents.

In summary, ICAITI should view the documentation process not primarily as a final phase with the archival flavor of a project termination, but as a crucial step in maintaining post-FWAE activity. ROCAP should show a corresponding flexibility, adjusting required documentation outputs to this more dynamic vision. Pre-fixed output targets have helped distort FWAE throughout its life. Such an evaluation mode conflicts directly with the wider ROCAP objective of encouraging ICAITI development towards greater market orientation.

VI. CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

(a) Programmed outputs for the project were all met or exceeded. Some new technologies attained market acceptance and have immediate potential for self-sustainability. Those technologies are:

- lumber kilns - technical assistance already nearing cost-recovery (all countries)
- solar salt (Guatemala and Honduras)
- brick kiln (PTR adoption in Honduras)
- batch bread oven (El Salvador)
- ceramic stoves (Guatemala)
- modified Brazilian charcoal kilns (Costa Rica)
- domestic (Lorena type) and institutional stoves (Honduras, El Salvador, Guatemala).

These technologies are responsible for almost all of the positive impacts of the project, namely:

- 13,000 beneficiary households,
- over 400 small industries directly stimulated or established with over 1,500 people employed,
- roughly 200,000 cubic meters of fuelwood conserved, primarily in critical deforested areas (due to large contribution of solar salt).

(b) These successes have not resulted in the project attaining the range and magnitude of impact for which potential exists. Among the successes, except for solar salt, beneficiaries (stove users) are a small to tiny percentage of the potential market. Self-sustaining mechanisms are generally not yet in place to assure an adequate and continuing flow of beneficiary impacts after FWAE termination. On the other hand, significant project resources were spent on technologies and their dissemination whose degree of market acceptance was small or nil. With proper evaluation, a significant re-directioning of resources and development/extension strategy would have taken place.

(c) The project's successes, failures and misallocation of resources confirm wider international experience: in order to achieve it's potential impact, a project of this nature requires that its organization, management and personnel be strongly market oriented, and respect some basic principles for introducing new technologies in the market place.

In general, FWAE project design completely lacked this orientation, and ICAITI made no significant attempt to modify the design. ICAITI also lacked experience in implementing this kind of extension process, exacerbating the problems of the project's original design and reducing overall effectiveness. Some specific "lessons learned" are:

- It is important to concentrate on market-oriented activities from the start. The first step should be a thorough study of the user market - the characteristics of the traditional techniques used for a particular process, the scope, the users' perceived needs, interests, problems and ability to pay. This market analysis is essential to define priorities and provide criteria for design or selection of the technologies to be introduced for testing.

- Testing and evaluation of prototypes should be designed to capture representative user information on technical bugs and user side effects (which may be critical). This requires full participation by the artisans, users and intermediate counterpart groups involved. The testing and evaluation cycle should continue until an appropriate design is identified by users. In most cases, designs were produced by an individual ICAITI technician working in the central office, and then sent out to be built and tested with insufficient input and feedback from users. Technologies such as the continuous bread oven and brick kiln were considered good, appropriate designs by the ICAITI technicians involved, because they fulfilled the project criteria of energy efficiency. The fact that they did not work for users was considered to be a separate problem unrelated to the hardware design. ("The technology is good, its just that the people don't use it correctly.")

- For prototype testing, it is necessary to establish clear criteria for site and beneficiary selection. Sites must be appropriate in terms of representativeness, physical characteristics, ownership, relationship to markets, etc. With beneficiaries the experimental nature of the process must be clear. The work should be carried out by experienced representative artisans.

- Providers of the essential services necessary for the commercialization of technologies should be identified and involved as early as possible. These providers will usually be in the private sector (including, but not restricted to artisans). Their participation is essential for the activity to be self-sustaining and will require that they earn a profit commensurate with the standards of the market for their services.

- Criteria must be established for counterpart selection. Counterparts may be involved at all stages of the development/extension process. Selection of the most appropriate counterparts may depend on the phase of the extension process and the beneficiary target group. Most counterparts will serve as intermediaries in extension and dissemination (e.g. PVO's), given ICAITI's regional role. In the earlier phases of extension it is especially important that they understand and accept the principles of the process if they are to add usefully to it. If they are not directly motivated (to provide essential services) by profit incentives, they must generally be oriented toward involving groups that will continue the activity on such a basis.

- It must be recognized that technologies that assume a significant change in work habits and organization (e.g., batch to continuous process, or different scale) require more study and analysis of their social implications and cultural acceptability. In general ICAITI's approach has been too engineering oriented, neglecting the essentially multi-disciplinary nature of this work.

- Market dissemination and promotion should not begin until it has been clearly demonstrated that the technology works well and is acceptable. Dissemination should be by steps of increasing scale. A plan should exist for transferring the technology to the market via mechanisms that offer a high potential for self-sustaining continuity. The promotional effort should be designed in accord with this plan for sustainability. Sustainability is far more important than achievement of numerical outputs. Financial mechanisms will usually be important for wide scale dissemination and should be identified.

(d) Project experience also showed that it is necessary to have positive and forceful management action based upon an understanding both of the principles referred to above as well as on sound project management skills to organize and orient activities and staff. FWAE suffered from some generic ICAITI management problems (e.g. definition of management responsibilities, delegate relations). In addition, some particular problem areas were:

- There were deficiencies in the maintenance and organization of files and documents and in the system of sharing information. Specific document clearance and filing procedures should be established.

- There was a relative lack of clear revision and approval process for selection of designs, beneficiaries, counterparts, test sites and procedures, etc. Until recently, most key decisions were left in the hands of individual technicians without the benefit of group knowledge and revision.

- Follow-up was not assured, due to weaknesses in the system of supervision (allowing individual projects to "fall between the cracks" and letting projects drag on indefinitely). Intense extension activity was not regularly monitored. There was inadequate revision of progress and results through field visits by supervisors and management.

- Management was excessively occupied providing information and reports requested by ROCAP on "outputs" that did not properly reflect project progress or success. In fairness, it must be noted that the nature and weight of the historic ICAITI/AID relationship favored this sort of relationship.

- There was inadequate attention to the transition to related post-FWAE activities, and how to relate such activities to FWAE project termination. Even though the origin of this problem lay in the original project design, plans for improved project termination have not been followed. Delay in articulation and execution of a transition strategy is a key factor which has placed continuation of FWAE-related activities in jeopardy.

(e) Potential exists for follow-on activities expanding from the specific technologies developed as well as from the counterpart institutional experience gained. These possibilities have been very inadequately explored. Major examples include:

- Informal sector support projects (El Salvador)

- Commercial "urban" stoves projects (Guatemala, Honduras, El Salvador)

- PTR/CDI follow-on projects (Honduras)

- Technical assistance for "private sector" programs targeted towards small businesses (Guatemala, Honduras, El Salvador)

- Technical assistance for lumber kilns and lumber/fine wood industries in general

- Assorted small projects and services (see Table II-5.1) where demand exists among many FWAE counterparts

- Specific training modules

The accumulated experience and contacts with more than a hundred counterpart organizations represents an important institutional legacy of the FWAE project.

6.2 Recommendations

Recommendations are oriented towards the more specific problems related to the transition to sustainable post-FWAE project activities. More detailed recommendations, including technology-specific recommendations, are presented in sections 2.8 and 5.2 through 5.5. Only the most central points are summarized here.

- Management must be overhauled immediately. A business plan must be developed which identifies priorities and concentrates scarce resources on them. Clear responsibilities and indicators of progress must be established, and regularly supervised and reviewed for adjustments. Systems must be developed for project identification and review, and proposal preparation must be streamlined. A clear sense of direction must be provided, something which has been lacking until now.

- It appears inevitable that staffing levels must be reduced. In order to avoid self-attrition in a crisis atmosphere, which threatens to result in the loss of the most talented personnel (with skills and demonstrated performance necessary for a positive transition), a planned review process should be established, Delegates should participate in this review of performance of personnel, which directly support the delegation and regularly travel to perform activities in the country. Personnel should be re-organized into functional groups around highest priority activities in documentation (only for remainder of 1987), promotion and sales of smaller services (including training), overall market analysis and new project development.

- There should be preparation to decentralize service delivery with greater reliance on national delegations, in response to emerging market. Resources adequate for market development at delegate level are a high priority.

- Pricing policies should be developed, aiming for higher cost recovery on marketable services. Innovative schemes should be developed for recovery from direct beneficiaries and delegations should have flexibility within guidelines. Policies on costing and overhead in general should be clarified, taking into account the need for multiple overheads reflecting differing personnel categories and service delivery support costs.

- Documentation process should be viewed not so much as a phase-out step of a terminating project, but more as a crucial part of a transition to sustainability of activities both within and outside ICAITI. The process should document "lessons learned" of both a technical and institutional nature from successes and failures, update manuals for key technologies and serve as an input for market development efforts. Much of the documentation process should be open to active review by key counterpart organizations. Outside capability for writing and evaluation should be contracted on a short-term basis to reinforce the documentation process.

- Resource allocation in terms of technologies should be re-organized to concentrate on consolidating successes (see Recommendations in Section 2.8).

In addition to the above recommendations for ICAITI, the evaluation has led to the following specific recommendations for ROCAP, beyond those found in Parts 4 and 5.

- As part of Options A or B for the PEEIR extension in Part 5, at least a portion of the market development activities outlined above and in Section 5.2 should be included within the business development/strategic planning activities whose funding within the extension is recommended there. The FWAE transition has many parallels to that recommended for PEEIR, the principal differences being smaller scale of the businesses and greater urgency. The change in the TOR of the extension would be small and would be a step towards a more integrated vision of technical services at ICAITI. These resources, even on a small scale, may be necessary to prevent the disintegration of the FWAE transition in an atmosphere of immediate crisis.

- ROCAP should give broker style support in assisting ICAITI to link with USAID and other donors for follow-on activities and new projects. Such support might be extended to sponsorship of several thematic seminars in 1980 to reinforce ICAITI marketing efforts. One area whcih merits special follow-up support is that of the urban fuel problem and the commercial stove development recently initiated by ICAITI. ROCAP could be influential in helping ICAITI to capture funds for continuation of these activities through other AID Missions, other donors, or S&T in Washington.

156

PART 3
EVALUATION OF THE REGIONAL INDUSTRIAL ENERGY EFFICIENCY PROJECT

PART 3

EVALUATION OF THE REGIONAL INDUSTRIAL ENERGY EFFICIENCY PROJECT

I. INTRODUCTION

This section of the Evaluation Report is concerned with the evaluation of the Regional Energy Efficiency Project (PEEIR) as conducted by a team of specialists of deLucia and Associates, Inc., during the period of mid June to mid August, 1987. For this purpose, the evaluation team has visited 32 privately owned companies and 3 state owned companies in Honduras, Costa Rica, El Salvador and Guatemala (direct beneficiaries of ICAITI's energy auditing program). A telephone survey interview was also conducted with 34 companies in Costa Rica that indirectly accrued benefits from ICAITI's seminars on energy conservation (some of these companies also participated in the audit program). Besides these industrial contracts, the team has talked with numerous energy governmental officers in each of these countries, including the Ministers of Energy of Costa Rica and El Salvador.

Several interviews have also been conducted with ICAITI and SIECA management and technical personnel, especially with the staff involved directly with the PEEIR. Special personal interviews were done with the country Delegates of all five countries (with the exception of the Delegate of Panama, who could not be visited - a telephone interview with the Panamanian Delegate was substituted, to at least cover the essential issues).

II. ORIGINAL PROJECT DESIGN

2.1 Project Background

Objectives:

The PEEIR was conceived and developed since 1982, under the leadership of ROCAP. It is scheduled to terminate on December 31, 1987.

The basic goal of the Project was to reduce the balance of payment deficit of Central America and Panama. For that end, the project had the purpose of improving the energy efficiency of the industry in the Central American Isthmus (with the exception of Nicaragua, which refused to sign the Chamber of Industry-ICAITI agreement), and to reduce industrial consumption of imported petroleum by introducing energy audits, conservation measures, and energy machinery. The Project is primarily focussed on medium and small enterprises in the food processing, beverage, textile, concrete derived products, chemical industries, metal processing and assembly plant industries.

110

In terms of the regional economic perspective, an 11% increase in energy efficiency was assumed for the industrial sector as a result of the project, and total annual savings of approximately $79 million in petroleum imports by 1992 were projected.

Motivation:

At the time PEEIR was conceived, just after the second oil crisis of 1979/1980, the economy of Central America was suffering from the worst crisis since the 1930's Depression. The overall balance of payments deficit has increased from $320 million in 1979, to $1.13 billion in 1980, and international reserves have plummeted to less than $400 million in 1981. The single most important economic factor behind this crisis was attributed to the cost of petroleum, which jumped from $101 million in 1973 (6% of total exports) to $399 million in 1978 (10% of export earnings), and $1.077 billion in 1981, when it represented 22% of export earnings. Rapid and massive capital flight, slumping of private investments, accelerated increase of foreign debt and government budget deficits, higher service charges on foreign debt and the collapse of the Central American Common Market, were some of the malignant consequences that followed (besides the unfortunate political consequences that plagued the Isthmus). Reduction of foreign exchange deficit became a top economic priority. Given that about 97% of the total oil consumed in the Isthmus was being imported, reduction in oil use was targeted.

Local governments soon started an intensive program of large hydroelectric power developments (Arenal-Corobici in Costa Rica; Chixoy in Guatemala; El Cajón in Honduras; and Fortuna in Panama) aiming for a fast substitution of oil used in thermal electricity generation.

Under these circumstances, ROCAP's task in the energy field became clear. Among the alternatives left, the next easiest and very important "source" of energy import savings was the industrial uses of petroleum. Although transportation was the most important oil using sector (being responsible for almost half of petroleum imports), the view at the time was that development of economically attractive alternative energies for gasoline and diesel would be too lengthy a process.

Project Components:

The project was comprised of five components, as listed below (with main task objectives):

Components	Task Objectives
1. Industrial Programs	° Energy audits ° Field and pilot demonstrations ° Seminars ° Exhibits
2. Training	° Improvement of ICAITI staff technical capacity in: - industrial energy management - energy auditing
3. Promotion activities	° Promotion and organization of seminars and audits ° Organization of conferences ° Diffusion of energy savings knowledge ° Promotion of institutional participation
4. Database and Analysis	° Database library on industry and energy ° Library services ° Analysis reports and statistics publications
5. Financing and Public Policy	° Macro-economic studies of energy policy ° Relation of project activities to national plans and policies

ICAITI was given the task of conducting the first four project components listed above. SIECA became responsible for the fifth component: the financing and public policy subjects.

Summary Financial Plan:

The cost saving breakdown of the Project is summarized below, with budget allocation for each of the components (in units of $1,000 dollars).

Project Component		ROCAP	ICAITI	SIECA	Industries and Private Sector Organizations	Total
I	Industry Program	1,789	-	-	300	2,087
II	Training	279	-	-	100	379
III	Promotion	1,014	-	-	500	1,514
IV	Data Base & Analysis	182	-	-	-	182
V	Financing & Policy Issues	526	-	260	-	786
VI	Management	1,207	-	-	-	1,207
VII	Evaluation	60	-	-	-	60
VIII	Overhead	74	440	-	-	514
IX	Contingencies	869	-	-	-	869
	Total	6,000	440	260	900	7,600

The ROCAP fund expenditures, divided between ICAITI and SIECA and given by years, is summarized below, together with the actual expenditures incurred (in units of $1,000 dollars). The sharp drop of actual expenditures realized in 1986 (as compared to 1985) was due to exchange devaluation, termination of high-cost foreign technical assistance contract, and personnel policy.

Year	ICAITI		SIECA	
	Planned*	Actual**	Planned*	Actual**
1982				
1983	914,737	630,092	109,092	35,256
1984	926,548	830,635	113,130	61,752
1985	1,464,309	936,417	117,509	42,467
1986	1,463,042	593,417	125,851	69,312
1987	631,364	523,860***	134,418	81,998***
TOTAL	5,400,000	2,884,938	600,000	290,785

SOURCES:

* Project Paper, Annex A-9

** ICAITI/SIECA

*** Expenditures from Jan. thru June multiplied by 2.

113

Outputs and Impacts:

1. Industry Programs and Other Components:

The planned outputs of the Industry Programs component of the PEEIR are listed below, together with the actual outputs achieved:

Actions	Original Planned Total	Proposed Modified Total to 1989*	Output Achieved (July 1987)
a. Energy audits			
° Level 1	290	150	132
° Level 2	45	130	96
b. Field and pilot demonstrations	87	80	12
c. Seminars	105	85	64
d. Exhibits	8	6	6
e. Auditors training	-	300	240
f. Promotional conferences	-	15	13
g. Promotional visits	-	425	454
h. Publications	-	110	83
i. Audits follow-ups	-	300	160

* Proposed by ICAITI in the 1987 Work Plan

The targets of components identified under the lettering (e) thru (h) were quantified in later years. The last modification was established in the 1987 Work Plan of PEEIR aiming for the year 1989.

2. Impacts

The expected impact of the PEEIR on the petroleum consumption was expressed in the Project Paper, Annex B-5, in tons of oil equivalent (toe) saved and is listed below for the first five years of the existence of the Project. The estimated savings to be achieved in 1987 is very roughly put at $5 million. For today's typical Bunker oil price of $190 per ton in the Isthmus, that would mean savings of 26,300 tons per year (14.4% of the expected savings).

Year	Expected Oil Savings (toe)
1983	25,000
1984	52,000
1985	110,000
1986	114,000
1987	182,000

Summary of Projects Highlights:

The following are the project highlights, which summarize the history of the PEEIR:

Date	Highlight	Activity
8/82	Project start-up	- Begin planning, recruiting, training of engineers and briefing of delegates
mid/1983	Staffing completed	- GIT, EER contracted for training, technology support, and assistance on database
end/1983	Audits, training completed	- First auditings began - Advertising agency contracted
1984	Full fledged operations began	- National Advisory Committees formed - Audits follow-ups began
1985	Consolidation year	- All the activities reached "cruising speed" - Last staffing realized
1986	Reorientation year	- 70% of total PEEIR numerical target objectives achieved - 35% of financial resources spent - Lack of motivation for savings detected

1987	Technical assistance year	- Start efforts of self-sustainability - audit price boost - Financing project of SIECA still not implemented - Energy cooperative plan proposed (credit incentives)

2.2 The Concept of Energy Conservation: PEEIR and its market

This section puts PEEIR into the general and modern view of the concept of energy conservation.

There are three basic ways to save energy, corresponding to three levels of savings categories:

1st. Through changes of habits (e.g., turning off lights when leaving a room, moving working hours off the power peaking hours, etc.). These types of measures typically can save, at most, 10%, but are lost when immediate pressure for savings is removed.

2nd. Through energy housekeeping (e.g., better boiler control, condensate tapping, better insulation, use of natural illumination, etc.). Typically the resultant savings approach 30%. They represent a one shot operation. Once undertaken, no further savings are contemplated.

3rd. Through technology change (e.g., coldwater mist curing of concrete as against steam humid curing, dry process of cement making as against humid process, high pressure sodium lamps replacing incandescent lamps, rotary compressors instead of reciprocating compressors, etc.). This type of process changes can result in dramatic energy savings, typically between 50 to 80%.

The PEEIR was designed to be of the second category. Indeed, the estimated energy savings achieved in the dozens of visited industries presented a maximum savings of about 30% in fuel consumption. Once combustion is optimized, steam pipes are well insulated, and steam leaks have been tapped, no further significant savings were contemplated. The main question for the industries, therefore, is a Shakespearian dilemma: to embark or not to embark in a savings program requiring larger investments. On the other hand, it has been noticed that electricity savings achieved by the followers of the auditing missions were much smaller, up to about 15% at most. And reluctance of the industries were noticeable, as the measures proposed often implied

some significative investments (although in many instances the payback was estimated to be favorable). Initial investment capital seems, therefore, to be a predominant problem. Monetary and/or fiscal incentives from the government, or the local utilities, seems to be of importance. This issue touches the core of the energy savings implementation program, which is addressed in the following section.

It should be understood that the market for PEEIR services is limited, if some degree of cost-effectiveness is contemplated. In the Isthmus, there are about 3,000 industries in the category of small, medium and medium-large sizes (more than 40-50 employees). Out of them, about 500 industries have more than 200 employees, and from them, about 100 are considered energy-intensive industries (more than 5% of production cost due to energy). This group is responsible for about 50% of total industrial energy consumption.

So far, ICAITI has audited (at Level II) 240 industries in general, and 40 of the energy intensive ones. From the point of view of cost recovery, it is obvious that ICAITI should concentrate on some selected industries to reduce the costs of energy auditing. These industries are limited in number, implying that soon the market could be exhausted in economic terms. A continued spread of PEEIR audits to less energy intensive or small and micro-industrial markets could be financed only with local government subsidy or by opening up other technical service opportunities.

In that respect, it is important to notice that for the Government, an investment on the energy demand side may turn out to be also very cost effective. For instance, experiences gathered by American utility companies and in several developing nations have shown that, it is much cheaper to invest on improvements of electricity end-uses efficiency than to invest on power generation. In Brazil it costs three times less to invest on higher efficiency refrigerators, and compact fluorescent lamps, than to build the corresponding kW saved of hydroelectric power plants. It is up to the local Government to realize the cost-effectiveness of energy efficiency improvements, which again constitute a matter of policy on energy efficiency improvement.

2.3 Economic-Energy Efficiency Strategy

It is becoming clear from ICAITI's own finding (December 22, 1986 letter of Director Ludwig Ingram, Jr., to ROCAP presenting PEEIR work plan for 1987) that the policy component of the PEEIR is crucial for its own survival as an effective program:

"... experience (gathered so far) has shown a lack of motivation of the industries to implement the conservation measures (OCE) with the expected speed ..."

117

"... nevertheless, while SIECA has published reports recommending 'the creation of more agile financing mechanisms', the process of obtaining this financing continues to be too slow and cumbersome to provide for the credit needs of industry."

In fact, energy auditing, the main single technical component of the PEEIR, is only one element of what should be an effective energy efficiency plan as pointed out earlier in Chapter III, Section 3.3, of Part 1 of this report.

In a well designed economic-energy efficiency plan conducted by the Governments of the Central American countries, technical activities such as the PEEIR should have become an item sought after by the industries, and not the other way around, since the industries and other sectors of the economy would be stimulated to reach a higher degree of efficiency. The limit to that efficiency, however, should be left to the market to decide. Nevertheless, the Government, should send signals to the market so that it would follow a path to a higher degree of efficiency. These signals could be the mentioned mechanisms of energy pricing, efficiency standards, monetary and fiscal incentives, institutional mechanisms, industrial policy and import tariffs, and information and technological developments. Energy auditing, together with continued technical assistance, could become integral parts of an industrial policy.

2.4 Conclusions and Recommendations

From the general strategic point of view, the original project design was correct for the economic-energy context, that prevailed at the time of conception of the PEEIR. Some problems encountered in the evolution of the project would appear to be more related to subsequent interpretation either by ROCAP or ICAITI which seems to have led to some distortion of operational objectives in the project paper (PP). This may in part be due to the relative precision given to these objectives in the paper. A good example is pricing policy. It is evident that the major flow of benefits was foreseen to result from self-sustaining audit/financing activities outside of the immediate scope of the project (pages 47-49 of PP), resulting from "multiplier" effects. Coherently the PP also speaks of the need to gradually increase the price of services from an initially highly subsidized level (p. 17 of PP). Unfortunately the criteria for a pricing policy and its intimate relation to technology transfer and sustainability were never emphasized in the PP. Thus over several years more precise intermediate output goals (e.g. number of audits) received overwhelming priority, especially since they were somewhat ambitious. Only as the project entered its final phase has management been able to focus on the more basic operational goal.

In the 5 years of operation, invaluable lessons and experiences have been gathered within the Project. At the same time on the international front, dramatic technological developments have occurred with respect to improvements in energy end-use efficiency. Experiences on energy conservation around the world have enriched the methodological aspects of energy efficiency improvement strategies; and new developments on the energy situation of the Isthmus have solidified the importance of the fuels utilized in the transportation sector as against the use of Bunker oil in industry. All these factors lead to the conclusion that some dramatic changes of the priorities originally set by ROCAP have to be performed.

In fact, ROCAP has already started to redirect its energy plan for Central America. A new project aiming to lay down the basis of an energy policy plan is being considered. In this plan, emphasis shall be put on the participation of each Government of the Isthmus to policy principles that could guide the economy-energy of these countries to a higher level of efficiency.

To that effect, with respect to the energy policy component of the PEEIR, channels in addition to SIECA should be found to conduct an intensive study of policy issues related to economic-energy efficiency, its regional aspects and national components. An intensive participation of local governmental institutions such as the ministries of finance, energy, industry, transportation, and planning is essential, as well as the electrical and oil companies, and the private sector.

ICAITI should play the role at the technical level directing technological developments, efficiency standards and normalizations, energy auditing and technical assistance.

The evaluation of specific matters of the PEEIR will be the subject of the next sections.

III. ADMINISTRATION AND MANAGEMENT STRATEGY

3.1 Organizational Structure

Present Structure:

Since its inception in 1984, the PEEIR has been by far the biggest project underway at ICAITI. The PEEIR and FWAE Projects together represent about 61% of total professional salary payments of the Institute. The PEEIR alone represents about 35% of ICAITI's total income today.

The PEEIR was originally designed to be administrated as a project within the ICAITI organizational structure. Its size, however, tended to overshadow the rest of the Institute, creating conflicts within the rigidly designed functional structure of the Institute. It is admirable that PEEIR is an efficient project within such a rigidly structured organization. Credit for this accomplishment probably lies with the high-quality of many of the professionals involved with the Project.

The analysis of the PEEIR organizational structure was done as part of the overall evaluation of ICAITI, described in the Part 4 of this report (which presents the components of the evaluation of ICAITI in general). In Part 4, a number of administration and management changes are recorded. These changes include the adoption of a matrix mode of organization and management, and the reduction in the number of Divisions within ICAITI.

The present organizational structure of the PEEIR is presented in Figure III-3.1. It is simple and designed in accordance with its personnel capability and talents. The number of subordinates for each manager is restricted to three, which indicates that it is well distributed and within the capability of the managers involved for this type of project. This structure can easily be adapted to the suggested new organizational structure of ICAITI.

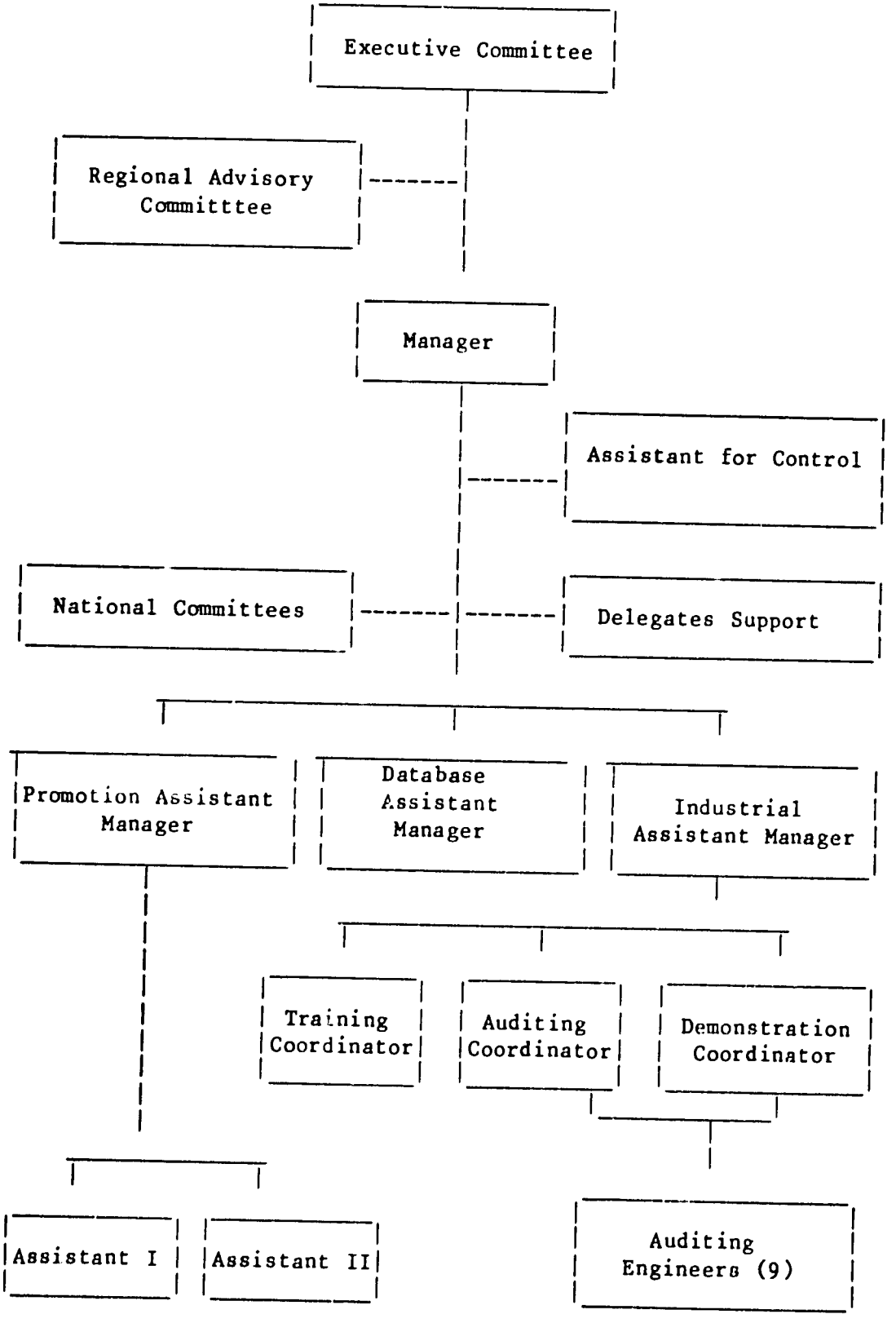
The Executive Committee, composed of the Director of ICAITI, the ROCAP Project Manager, head of the Technical Services, the Division, the ICAITI Project Manager (and originally an advisor of the Georgia Institute of Technology) is the operational decision-making committee. It met frequently on a scheduled basis in the early part of the project. It now meets occassionally on a ad hoc basis.

The Regional Advisory Committee has a role similar to a Board of Directors in a corporation. It is composed of the representatives of the Secretariat for Central American Economic Integration (SIECA), the Regional Federation of Chambers of Commerce (FECAICA), the Central American Business Institute (INCAE) and the Central American Bank for

125

FIGURE III-3.1

The present organizational structure of the PEEIR with the addition of a planning and control assistant.



Economic Integration (CABEI). The Director of ICAITI is also a Committee member. This Committee meets once a year and its influences on the matters of PEEIR is very limited.

The National Committees vary in composition from country to country but they are composed predominantly of the representatives of the local Chamber of Industries and national association of industrialists. They serve the role of advisors to PEEIR on the matters of its relation to local industries and industrial policies.

The Delegations personnel involved with PEEIR are paid from headquarters but their office space is provided by the local Chamber of Industries or equivalent institutions (except for the case of Honduras, where office space is rented by ICAITI). Roughly two-thirds of the Delegate's time is devoted to the Project. The Delegations do not have budgets, except for specifically authorized projects and activities. They report expenses accounting directly to the Division Chief of Budget and Cost Control of ICAITI and not to the Project Manager.

One suggestion for the improvement of the main flaw of the present organizational structure is to hire a planning assistant to the Project Manager. This assistant would help him in laying down a general planning and control system for PEEIR by integrating promotion, database, training and industry programs in a consistent unit, and follow-up its development.

The weakest points, however, remain in the operational aspects of the PEEIR, which are the subject of the next section. The PEEIR is inserted into a highly vertically functionalized structure of the ICAITI as one more closed vertical organization. Its interaction with the rest of the ICAITI's structure is done by respecting the other verticalized units, such as the Budget and Cost Control, and the Administration and Financial Divisions, in their own areas of competence. However, it tries to operate in a matrix organization mode with the Delegates in regard with the matters of mutual interest such as the choice of the clients, seminars, etc., and that is a source of problems. The major flaws of the present operational mode have their roots on the poor comprehension of how matrix organization works, and the nonexistence of administrative norms and procedures. In the Section 3.1.2 of Part 4, these flaws are described at length. They can be summarized as follows:

(a) The Project Manager of PEEIR does not have the necessary and due authority as a manager in a matrix mode of organization (control of costs, schedules and allocated human resources). Substantial portion of his authority has been taken over by the head of the Technical Services Division that coordinates the PEEIR.

(b) The Project Manager has no authority over the fifth component of the PEEIR (Financing and Policy Issues) which is run by SIECA through a direct sponsoring from ROCAP. This lack of linkage between ICAITI's portion of the PEEIR and the SIECA's component has contributed to some disassociation of policy analysis from PPEIR needs. The failure of SIECA to induce government agencies to make necessary changes has hampered the development of a highly motivated market for the PEEIR.

(c) The frequent disagreement between PEEIR management and the Delegates.

The recommendations as to the solutions of these distortions are made in Part 4, under the General Evaluation of ICAITI, given that its resolutions affect ICAITI's management as a whole.

3.2 Operation of the PEEIR

The operation of PEEIR has been strongly oriented toward the accomplishment of the preestablished goals, most of them numerically measured. In that regard it has operated successfully reaching the target goals consistently and even surpassing them. Project management has shown some disposition to questions and try to modify original project priiorities and numeric goals. The changes induced have contributed positively to project performance.

Some of the problems encountered by the evaluation team that could be hampering the motivation and the improvement of efficiency are the following:

Financial Management

a. Neither the Project Manager nor the assistant managers can authorize any expenses without the signature of the head of TSD (acting Director of ICAITI). This is an overly centralized and inefficient way of cost control. A solution could be a graded expenses authorization scheme such as the following:

Expenses	Authorized by
less than 1,000 Quetzales	Assistant Manager
less than 10,000 Quetzales	Manager
more than 10,000 Quetzales	Division Head and/or Director of ICAITI

b. Spending incurred by the Delegates on PEEIR services are reported directly to the Division Chief of Budget Cost and Control. These expenses should be reported to the Project Manager as the natural channel in a matrix administration.

Progress Reporting

a. The Project Manager prepares four progress reports to ROCAP, annually. The reports are reviewed by the Director of ICAITI who formally send them to ROCAP.

b. There is no systematic procedure of progress reporting of assistant managers and their subordinates to their superiors. Not even since early 1985, were assistant managers required to write trimestral progress reports to the Project Manager in which, besides the progress achieved, activities were planned for the following three months. This practice is felt to be important for project control and it is recommended that be restored.

Procurement of Goods and Services

a. There are no established norms and procedures for services contracting, and equipments procurement is done through ICAITI's regular channels. Procurement services done by ICAITI are regularly charged to PEEIR account and they just follow the internal and ROCAP's bureaucratic requirements. It is recommended that a clear procedure for procurement of goods and services be written and followed.

Approvals

a. The Director's authority on PEEIR's matters is felt to be too centralized, at a cost of weakening the Project Manager's authority. A correction of this distortion is recommended through restoration of the Project Manager's rightful authority.

b. On the lower level, the Project Manager also centralizes his authority too much, at the cost of Assistant Manager's authority. Several decisions are taken by the Project Manager without consultation with Assistant Managers.

It is remarkable that PEEIR performed as well as it has over four years of operation without clearly written administrative norms and procedures defining the task distributions, lines of responsibilities, communication flows, authority, etc.

121

The main general recommendations are the following:

a. It is recommended that the Regional Advisory Committee meet biannually and not once a year as done at present. In order to balance out the industrial community participation in the highest policy making Board, two representatives of the industries should become members of the Committee, chosen among the heads of the Chamber of Industry, or national association of industries, of distinct countries for a term of one year, in a rotating mode.

b. It is recommended that more frequent meetings be held between all the Delegates and the Project Manager to resolve administrative matters, communication flaws and to exchange ideas amongst themselves on all other ICAITI matters. These flaws were detected by the evaluation team as factors affecting the relations between the Delegations and the PEEIR's managers at ICAITI.

Project Personnel

The distribution of the personnel assigned to each of the components of the PEEIR is shown in the Table III-3.1 below.

TABLE III-3.1
PROFESSIONAL PERSONNEL DISTRIBUTION AMONG THE COMPONENTS OF THE PEEIR

Components	Number of Professional Personnel
1. Industrial Program (ICAITI)	10
2. Training (ICAITI)	1
3. Promotion (ICAITI)	3
4. Database (ICAITI)	1
5. Financing and Public Policy (SIECA)	5
6. Country Delegates Assistants *	3
Total	23

* Besides the Assistants, who can play a technical supporting role, the Delegates themselves act as marketing and administrative support personnel.

However, besides the professional staff nine support personnel, including secretaries and other administrative personnel, are in the PEEIR payroll computed as direct salaries. Besides, under the personnel payments item, 30% of overhead is paid to ICAITI as indirect administrative costs ($45,000 for 1987). Currently, the total personnel item amounts to about $195,000 dollars per annum.

Understanding of Project Goals and Personnel Moral

The evaluation team felt that, in general, Project personnel understand very well the Project goals as stated in the original Project Paper. However, their understanding follows essentially the line path of numerical targets to be achieved. From mid 1986 onwards the target-objectives have tilted toward cost-recovery and self-sustainability. At present the Project personnel are passing through a transitional period of psychological expectations and stress that normally affect the employees involved in organizational changes. It is important that the Project management shows a clear and secure sense of direction to their subordinates. Otherwise, the morale of the team could start slipping.

From a motivational point of view, it should be observed that the Project already has entered into a maturing stage, when Project activities tend to become routine. Staff have learned the techniques, tested them in the field, and the project has now reached "cruising speed." Derived from this stage of development of the PEEIR, the evaluation team has felt that the technical personnel is highly motivated to seek out new realms of activity. Expectations are high, and the staff is ready to move into new challenging tasks such as deeper savings technology (process engineering) or marketing with a cost-recovery mentality. If these expectations are not realized motivation could be seriously affected.

Some recommendations:

a. It is fundamental that a clear set of new objectives be set and communicated to the Project team (i.e., market orientation and new technological advances into energy savings).

b. Sweeping organizational changes have to be realized, mainly in view of the upcoming necessity to implant a market oriented philosophy within the group. For that purpose, several definitions should be made, such as:

   -Definition of the services (product definition) to sell: courses, seminar, auditing, follow-up, measurements, organization and operation of energy committees, technical assistance, etc. Which kinds of technical assistance?

-Definition of the organizational structure for quality production and "packaging" of these products.

-Definition of the marketing, planning, policy and strategy, and market research.

-Organization of sales capability, and contracts, etc.

3.3 Development of Self-Sustainability

ICAITI's Situation

The self-sustainability of PEEIR is strongly related to the similar issue for ICAITI as a whole, given that cross linking between projects, and PEEIR's relations with ICAITI can have a positive or negative influence on sustainability.

Only recently, with the close of the project approaching, has the matter of self-sustainability surfaced and become an important issue. Neither of the two previous evaluations addressed this issue.

At present, ICAITI's incomes are derived from three basic sources: government contracts and contributing quotas (10%); international technical assistance contracts (75%), and the private sector (15%), ROCAP and other AID sources comprise about 64%, and other international agencies funding are responsible for about 11% of total income. The latter finding comes mainly from the Organization of American States, West Germany, and Canada (IDRC), in that order of importance. Government quotas which nominally total $425,000 dollars effectively rerpresent a much smaller amount.

The 1986 ICAITI's Division cost and income summary is shown in Table III-3.2. It clearly reflects the importance of the PEEIR and FWAE projects carried out in the Division of Technical-Industrial Services, and the correspondingly minor importance of the Division of Norms and Standards, and that of the Division of Information and Documentation and Technial Edition.

TABLE III-3.2
ICAITI's DIVISIONS COST AND INCOME SUMMARY FOR 1986

Divisions	Costs US$	Income US$
- Information and Documentation and Technical Edition	23,000	18,200
- Applied Research	433,300	433,900
- Analysis and Testing	149,500	121,700
- Norms and Standards	53,100	54,000
- Technical-Industrial Services	1,215,200	1,175,700
- (Indirect support)	181,500	-
- (Country's contributions)	-	308,700
- (Others)	-	18,500
Total	1,874,100	2,130,700

The overall cost of overhead at ICAITI is estimated by the Division of Budget and Cost Control as 30%. The social cost component over the salaries paid by ICAITI has the following breakdown as shown in the Table III-3.3 below:

TABLE III-3.3
SOCIAL COST COMPONENT BREAKDOWN PAID OVER THE SALARIES AT ICAITI'S HEADQUARTERS

Component	Percentage Over the Salary
- Pension plan	10.80
- Medical care allowance	3.53
- Christmas bonus	8.33
- Income tax reimbursement* (total average)	3.41

* Valid only for Guatemalans. The citizens of other countries of the Isthmus are tax exempt in their original countries.

The salaries at ICAITI are estimated to be between 50 and 70% of the salaries prevailing in the private sector. The motivation to stay at ICAITI derives mainly from the relative stability of employment, and the research atmosphere.

3.3.2 Situation of the PEEIR

Table III-3.4 below shows the income derived from the fees paid by the participants of the seminars given by the PEEIR and the FWAE Projects in the years 1984, 1985 and 1986. These incomes are counted in the year actually received at ICAITI headquarters and not in the year seminars were held.

TABLE III-3.4
INCOME FROM THE PEEIR AND FWAE SEMINARS (US$)

PEEIR	1984	1985	1986
- In Guatemala	8,877	3,321	1,827
- In El Salvador	3,822	1,990	1,827
- In Honduras	4,179	7,377	1,718
- In Costa Rica	7,142	5,338	7,892
- In Panama	797	1,234	480
Total PEEIR	24,817	19,250	15,050
Total FWAE	-	2,065	527

The largest source of income of PEEIR, however, is the energy auditing of industries. There are two basic types of audits: energy auditing done through a half-day on-site visit followed by a mainly qualitative diagnosis of plant energy efficiency, known as Level 1 Audit, and of Level 2, which are detailed, instrumented energy audit requiring up to 15 person-days of on-site work. The Level 1 audits transformed into "promotional visits" in mid 1985.

Table III-3.5 below shows the income derived from energy auditing. In this case, also, the income accounting corresponds to the year funds were actually received by the treasury of ICAITI, which does not coincide necessarily with the year auditings were actually performed.

TABLE III-3.5
INCOME DISTRIBUTION BY YEAR AND COUNTRY
DERIVED FROM ENERGY AUDITINGS (US$)

Country	1984	1985	1986	1987*
- Guatemala	2,050	8,887	2,726	3,878
- El Salvador	270	3,604	796	250
- Honduras	2,625	6,452	14,512	1,860
- Costa Rica	-	2,968	4,356	1,234
- Panama	-	6,100	3,200	12,400
Total	4,945	28,011	25,590	19,622

* From January through June only.

On the other hand, Table III-3.6 gives the expenditures actually incurred by the entire PEEIR, divided into direct salaries, equipment, and other operating expenses. This breakdown was motivated by the fact that salary expenditures have suffered fluctuations due to external factors, such as exchange rates and the leveling off of PEEIR staff salaries to the salary levels and rules of ICAITI employees (which actually happened in early 1986). PEEIR staff previously had salary levels above those of other employees of ICAITI.

TABLE III-3.6
PEEIR TOTAL EXPENDITURES ACTUALLY INCURRED BY YEAR ($1,000 dollar)

Component	1983	1984	1985	1986	1987*
- Direct salaries	336.8	359.8	253.4	145.1	90.9
- Equipment	19.8	45.3	60.3	50.6	7.9
- Other expenses	273.5	425.5	622.6	397.7	163.1
Total expenses	630.1	830.6	936.4	593.4	261.9

* From January through June.

Table III-3.7 shows the percentage ratio of the income derived from energy auditing divided by the total expenditures minus direct personnel salaries and the expenditures incurred from equipments acquisitions. (Note: The objective of this exercise is to be able to observe real changes in cost recovery. Salary distortion due to changes in ICAITI policy would have made this difficult.)

TABLE III-3.7
RATIO BETWEEN INCOME FROM AUDITS AND EXPENSES
OTHER THAN DIRECT SALARIES AND EQUIPMENTS

	1984	1985	1986	1987*
Audits other expenses**	1.16%	4.50%	6.43%	12.0%

* From January through June.
** Total expenses minus direct salaries and equipment acquisition.

Preoccupation with cost-recovery only became a real issue in mid 1986. However, the above results are an indication that cost recovery is now moving in the right direction, although it is still quite low.

3.3.3 Cost-Recovery and Self-Sustainability

Table III-3.8 shows the estimated average cost of energy auditing of Level 2 for different countries, according to PEEIR. This average cost reflects the difference in exchange rates between the currencies, the cost of living, travel expenses, etc.

TABLE III-3.8
ESTIMATED AVERAGE COST OF ENERGY AUDITS
IN INDIVIDUAL COUNTRIES OF THE ISTHMUS

Country	Costs (US$)
- Guatemala	2,717
- El Salvador	4,911
- Honduras	5,174
- Costa Rica	5,237
- Panama	4,685

These differences suggest that one area open for cost rationalization would be a greater use of local personnel, in order to cut down the travel expenses. However, this advantage may be cut down by salary differences between Guatemala and other countries (much lower in Guatemala in dollar terms). In any case, the cost differential presented in Table III-3.8 should be the subject of further study, with the participation of the Project management and the Delegates.

The costs presented in Table III-3.8 include the cost of two follow-up visits, estimated at $700 dollars per industry in direct costs, but they do not include the per industry cost of promotion, estimated to be about $50 dollar.

The average human effort per audit of Level 2 is estimated to be 35 man-days, which includes between 25 to 30 days effort for one engineer to start and complete the whole process of an audit, including the write-up of the final report, and 5 days help from an Assistant to a Country Delegate during measurements performed at the chosen industry.

Starting from January 1987, the price for an audit was set at 60% of the estimated average cost of the audit taken from the Table III-3.8 above. Clearly enough, the pricing of energy auditings by the PEEIR is a serious issue since the cost of realizing an audit depends on so many varied factors such as size of industry, number and types of boilers, length, routing and size of steam pipelines, number of electric motors, lighting, electric furnaces, type of industry, characteristics of the substation, total electric and fuel consumptions, etc. The evaluation

team detected strong reactions to high costs from the Delegates of countries where costs are highest (e.g., Honduras and Costa Rica). The Delegation of Costa Rica, for instance, feel confident enough to perform auditing by themselves at much lower cost. This last position is strongly contested by headquarters Project management, which has plausibly documented its case. Given different exchange rate policies between countries headquarter's position may be correct about relative costs of centralized versus decentralized service delivery at present. However, as discussed in Part IV, section 3.2.1, other factors should also be considered in developing a policy on this subject.

Cost recovery and the need to have some degree of self sustaining financing are, therefore, an important issue for both the fuelwood/renewable energy and energy efficiency USAID sponsored projects at ICAITI. There are important differences in the nature of the problem when viewed from the differing perspectives of the two projects, but in general there is missing a well thought-out and developed pricing and cost recovery set of policies and implementing procedures. The evaluation team strongly recommends the development of such a set of policies. The discussion below outlines some of the teams findings and initial thoughts that could be reflected in such policies for energy efficiency activities.

3.3.4 The Need for Stable Pricing Policies

Both the purveyors and users of conservation technical assistance prefer stability in the pricing of these services to allow planning and decision making in a more certain environment. Moreover, there is an equity argument for treating users the same or at least similarly in that the pricing is under a stable policy even though the policy may provide for changing prices. If the policy needs to include price changes (as the project experience has shown to be the case), it would be best that the guidelines for such changes be thought out from the beginning and articulated as part of the policy from the start. Thus the policy might have been to gradually achieve a certain degree of cost recovery over a period of say 3 to 5 years, which should have been known or made known to both the delegates (the purveyors) and the users to avoid problems with firms that will often have the capacity to pay the full cost of the service/technology implementation but exhibit an unwillingness to pay. The later may stem from the view of industrialists wanting to see results before paying, or an association of the assistance with "government programs" and a reluctance to pay for assistance they perceive can be had for free (or which they know other users/beneficiaries received previously for free). Policies that had clearly incorporated an increasing degree of cost recovery each year would have helped to overcome these sources of unwillingness to pay.

In its 1987 work plan, ICAITI proposed that it start attempting to recover 100% of the direct costs of audits. The evaluation team feels that the move to increase cost recovery on audits was definitely correct; a positive and necessary step. Previously, the audits were practically being given away. With the establishment of the new policy in 1987, ICAITI has begun the very important task of thinking about its costs and pricing policies. It has also brought this issue to the table for discussion with delegations and Chambers of Industry in the participating countries. All these activities were necessary, and given the lack of a long-term pricing scheme from the beginning, the evaluation team feels that the increase established by the new policy is much preferable to no increase (the other option supported by the Chambers and delegates). The flaw in the process originated with the lack of a clear, long-term pricing plan, and was apparently exacerbated by the abruptness of the change and deficiencies in internal communication.

Of course, stability in pricing is not the only needed pricing policy characteristic. Flexibility of various types, including the capacity to modify pricing as a function of user/beneficiary characteristics, is needed.

3.3.5 Need for Alternative Policies for Different Beneficiary Characteristics

The pricing of ICAITI technical assistance services will in general need to reflect the following differences between users/beneficiaries:

a. Differences in technical process or scale (e.g. an audit for a large brewery differs significantly from one for a small furniture factory), these differences will affect the level and costs of the audit services;

b. The differences in the financial strength of the firm, which affect the capacity and willingness to pay both for the auditing services and the necessary investment and operations changes, and may also affect the firms preference for payment procedures- (lump sum versus time payment); and,

c. The differences in the actual (as opposed to estimated) benefits the energy savings users/beneficiaries achieve.

3.3.6 The Need for Flexible and Innovative Pricing/Cost Recovery Policies

Many of the issues relevant to this discussion parallel those made in the case of the FWAE project. However, this discussion of needed flexibility in the energy efficiency pricing policies is more critical, as these activities are more likely to continue. As in the Fuelwood Project, it can be argued that in principle every user/beneficiary has a different financial capacity and willingness to pay. And while it

134

would be administratively difficult to devise policies that treat every case separately, there is much to be said to developing a pricing and cost recovery policy that provides, within guidelines, a reasonable degree of pricing/cost recovery autonomy to the individual delegations: a policy that allows the delegations to adjust the price (or procedure/schedule for collection) to reflect the particulars of the situation. The Delegates are the staff closest to the market. With indications of cost recovery targets established in ICAITI/USAID guidelines, and with the help of information and assistance from others (e.g., the Chambers of Industry), the Delegates would be better able to tailor a pricing approach to a particular user or beneficiary. The possibilities that should be examined in the development of such a flexible pricing policy are much the same as those which were mentioned in the context of the Fuelwood project with some shift in the emphasis. Amongst these are the following:

a. time payment schemes rather than initial up front payments, fees could be paid over time either based on work effort in the audit; or,

b. fees based on savings, i.e. shared savings or royalty type schemes, as have been implemented elsewhere, fees could be constrained at some minimum to cover percentage of audits costs and at a maximum to recover at most some multiple of costs;

c. fees based on savings, but in case where ICAITI provides additional services possible, full turnkey efforts to implement the results recommended by the Level 2 audit.

The last alternative is the approach suggested in a proposal outlined by members of the Costa Rican Chambers of Industry in conjunction with the ICAITI program in Costa Rica. This approach, if it were truly turnkey, would require a financing fund or revolving line of credits.

From the information we have gathered so far, one can identify two basic dimensions to cost-recovery and self-sustainability, which are:

a. Organizational changes
b. Energy policy component

On one hand, significant organizational changes have to be performed in ICAITI so that right instruments be provided on the institutional side to enhance the chances of self-sustainability. On the other hand, if wrong policy signals, or no signals, are given to the market, self-sustainability can be at jeopardy.

3.3.7 Organizational Changes

For ICAITI as a whole and the PEEIR as one project, the improvement of their managerial capability is fundamental for enhancing the chances of sustainability. Besides the organizational structure, there is a basic need for improving the managerial practices. Especially for PEEIR, the following actions are recommended:

a. Rationalization of Costs:

- A cut in the number of auditors, selected by quality. Also, a selective reduction of personnel in general.

- Provision of further specialized training for the auditors on process engineering and deeper general engineering.

- A raise in auditors' salaries to market levels. (They are being paid much less than the market levels.)

b. Market Considerations:

- Provision of managerial courses oriented towards improvement of marketing skills.

- Selection of clients based on cost-effectiveness potential, and not on social benefits or political constraints. The exception would be special "public image" cases (as discussed below under institutional strategy.

- Clear definition of the "products" to sell, categorized into three types:

  i. "Products" ready to be sold: audits, courses, seminars, organization of energy committees, follow-up measurements and assistance, general energy balance measurements, etc.

  ii. "Products" quasi-ready to be sold: services for which preparations are required institutionally and technically such as process engineering in certain areas of industry.

  iii. "Advanced Products" for which major technical knowledge is required.

- Amplification of market opportunities to specialized energy-intensive industries, such as cement factories, oil refineries, electrical utilities power plants, and especially, sugar mills and coffee related industries.

- Widening of technological specialization and the menu offered to potential clients, such as cogeneration, heat pumps, energy

management systems, etc. External consultants have to be pulled from an organized "brain bank" whenever needed.

Significant improvement of the back-end of the marketing process (i.e., preparation of proposals in a highly professional style), with use of micro-processing capability to standardize the curriculum vitae of technical participants and of ICAITI's qualification. The presentation of proposals, as it is done today, does not conform to the modern marketing practices and needs significant improvements to fit into a new market-oriented strategy.

- Direction of promotional activities toward selected market sectors and focussed on marketing and sales.

- Conduct of market pilot tests whenever necessary (for instance, implementation of turnkey job in a selected office building under a contract for payment of the services based on after savings have been achieved). This particular example is suggested for Costa Rica where energy tariff structure is more conducive to savings than in other countries.

c. Institution Strategy Considerations:

- After substantial improvements are achieved in the management of the PEEIR, ICAITI should look after the external markets, mainly in the Caribbean and South America, for possible foreign customers of energy audits and their follow-up technical assistance.

- Protect PEEIR's public image by providing energy auditings to less cost-effective industries, such as small industries of social importance, at a maximum level possible (without compromising, however, overall sustainability.

- Cost-effectiveness should be looked at in its totality. Energy auditing of small industries may play a role of "loss leader" to conquer the market for general technical assistance. In fact, small industries sector may represent the most promising market for technical assistance as they are the ones most in need of this assistance. Assistance contracts with retainer fees may work out best for them. However, a considerable managerial capability and adequate staff have to be created for that purpose.

- Follow-up on energy auditing and continuous checking of energy consumption, through technical assistance contracts may represent another activity of services open for contracting.

- Possibly greater use of Delegates staff and local country consultants to perform energy auditings, seminars and other PEEIR activities.

- Develop and execute institutional strategies geared toward the untying of some of the important knots in the existing energy policies in the countries of the Isthmus representing crucial barriers to energy conservation. These obstacles, as well as the incentives for conservation are referred in the section just below.

- Go after the market in the commercial and public sectors where in many cases opportunities are significant. Office buildings, hotels and hospitals may constitute important markets for PEEIR because their energy consumption, before and after the implementation of the OCEs, can be measured easily
- through utilities electrical bills and oil companies bills, while, on the production side, the number of hotel guests and hospital patients can also be measured.

3.3.8 Energy Policy Component and ICAITI Strategy

It is of utmost importance that energy policies in the different countries be conducive to energy conservation in order to stimulate demand for PEEIR services and effectively provoke energy conservation. Otherwise PEEIR's efficiency will be hampered by counter-incentives. Examples of policy incentive can be found in energy pricing: Energy forms have to be priced so that market distortions are minimized and price structure is conducive to selected energy carriers of national interest. Often, tariffs are structured so as to decrease the motivation for energy conservation. The current rules of INDE in Guatemala, for example, effectively penalize a customer who has invested in capacitor compensation to lower his power factor, by establishing that the demand charge remain at the same (high) level for 11 months after the investment has been made. Only after this period has elapsed is the customer compensated for his investment through application of a lower demand charge.

To deal with such disincentives, which have been found in several instances by the evaluation team, a strategy has to focus on a direct effort to convince electrical utilities to change rules to their own benefit and to establish rules and preferential tariffs to improve overall power factor and off-peak uses of energy.

In Section 3.3.6 among the three options given for industry to pay for implementation of OCEs, option (b) calls for fees based on savings. One spin-off idea, which should be left for further examination, is supervision of the implementation of the OCEs by ICAITI, including monitoring of energy utilization before and after the

implementation. In order to execute this implementation, the issue is the availability of financing for ICAITI. Regular financing schemes are not applicable to ICAITI since the Institute can neither provide the guarantees for the loans incurred, nor does it have the capability to manage venture projects where a package such as turnkey jobs is offered. Therefore, some mechanisms should be studied to discover a way of circumventing the need of collateral for such a loan.

3.4 Areas of External Cooperation

3.4.1 Private sector Energy Consultative Committees

The original project design provided for national private sector consultative committees, "to assist in making effective use of the promotional and information dissemination channels, and to provide feedback on the performance and impact of the project". The national committees now meet annually as a group with the staff of ICAITI, and the regional federation of chambers of industry (FECAICA). These annual meetings, four months before the submission of ICAITI's work plan, evidently do influence its direction.

Performance of these committees at the national level, however, varies widely. In Costa Rica and Honduras, they appear to make a considerable impact at the Delegation level. In El Salvador, industry associations are fragmented; the President of the Instituto Salvadoreño de Industrias (regarded as primarily a lobbying rather than a business service organization) does attend the regional meetings but otherwise plays no role. In Guatemala, there is no functioning consultative committee. Thus, the feedback of the energy advisory committee on the impact of the project is spotty.

In the case of SIECA, this institution has established relations with national central banks, in order to mobilize financing for investment in energy savings but without an effective success. CABEI, on the other hand, has expressed minimal interest in the project.

Interviews with Executive Secretaries of Chambers of Industry in El Salvador and Guatemala, reveal a perception that the use of energy in industry is too narrow an issue on which a high-level committee might focus. At this time, there is in most countries of Central America an intensified interest in productivity and quality control, especially for export markets. The most effective way of improving private sector involvement would thus be to reconstitute these committees in that mold. The Executive Secretaries in El Salvador and Guatemala also showed a keen interest in technical standards, norms and quality control, which they are in a position to pressure their respective governments to adopt, and in which ICAITI has a strong capability and track record.

3.4.2 Regional Integration

The Central American Common Market has been losing momentum for almost a decade. There is now a renewed interest in strengthening the regional institutions, including SIECA AND ICAITI. This subject is on the agenda of the next meeting of Central American heads of state. There are a number of ways in which both institutions could contribute to the process of economic unification in a significant manner, once the political decisions were taken to reconstitute the Common Market. Among these are the levelling of energy prices throughout the region, the promotion of river development on border rivers, and the negotiation of international energy exchanges.

3.4.3 Identification of Key Groups and Institutions

In general, ICAITI's interaction with other technical service institutions in Central America has been limited, specially in the field of cooperation in joint projects, though this is due in part to the original design of projects sponsored by international organizations. The ICAITI component of PEEIR, because of its narrow focus and industrial service emphasis, has largely been exempt from this rivalry. In all countries but Costa Rica, there has been no private-sector competition with ICAITI for sale of energy audits to industry, except some providers of boilers and water-softening agents for boilers. Prior to termination of the project, such competitors need to be canvassed as to their interest in providing broader services, and as to their training and other needs in order to accomplish it.

Other key groups, some of which are in contact with the Delegations, include:

- Associations of exporters
- Associations of small industries
- Associations of specialized producers: sugar cane, coffee, textiles and clothes, etc.

These groups as a whole have been more influential in influencing PEEIR policies at the country level than the formal energy advisory committees.

3.4.4 Dissemination of Publications

PEEIR technical and instructional materials are universally recognized as being of high quality, relevant and well presented. The Team encountered high receptivity to them by industrial users, of which there are over 2,000. In addition to printed matter, there are a number of well-done videotapes. Several of those interviewed expressed a desire to have the tapes presented in their plants, however, this would represent a marginal use of staff time under present conditions.

Training seminars are now fairly standardized productions, broken into specific segments and combined into seminars according to the demand for them. These include:

- Boiler Efficiency
- Efficient use of Electricity
- Energy Saving in Your Plant (for senior executives)
- Equipment and Methods for Measurement of Energy Efficiency
- Energy Saving in Steam Systems
- Energy Saving in Buildings
- Energy Savings in Air Conditioning and Combustion Systems

During the life of the Project, there have been 54 seminars with 2,067 participants. Most of these have lasted 1-2 days and for the most part involved production or maintenance managers. Virtually all involve some degree of practical work.

There seems to be little follow-up by ICAITI of the seminar attendees, in order to know the practical consequences of this training. Survey work by the team in Costa Rica suggests that this has been highly effective.

IV. THE IMPLEMENTATION OF PREVIOUS RECOMMENDATIONS

4.1 Introduction and Major Recommendations

There have been two previous evaluations of the PEEIR, both conducted by Hagler, Bailly & Company. The first was done in November, 1984 and the second in November, 1985. The second evaluation was more of a follow-up on the implementation of the 1984 recommendations than an evaluation per se.

The evaluation team has examined the degree of effectiveness on the part of PEEIR management in implementing the recommendations formulated in the previous evaluations. Several recommendations have not been implemented, some of them still very relevant. Therefore, the evaluation team commented only on those recommendations that are relevant today and were not yet implemented. In the discussions that follow, these recommendations are referred to by the letter "R". Recommendations made in the first evaluation are referred to by the symbol "R1", those in the second evaluation by "R2". Comments on these previously-made recommendations found to be still relevant are preceded by the letter "C".

The major recommendations and the status of their implementation are the following:

R - Develop individual evaluation/incentive scheme for Project staff (R1-R2).

C - This recommendation, although given the first time as far back as the end of 1984 and again recommended in the second evaluation report, has not been implemented. As a matter of fact, the procedures and policy for personnel evaluation and compensation should be part of a manual of administrative procedures that is nonexistent. This recommendation remains very valid today.

R - Initiate Project decentralization and private sector involvement (R1-R2).

C - These recommendations were part of both evaluation reports. They still constitute valid recommendations, although with conditions. The decentralization should be well thought out and discussed with the Delegates, having in mind cost rationality as the main focus, but being careful not to further weaken Project Manager's authority. Therefore, any decentralization plan must be preceded by the definition of authority and task distribution, and other administrative norms and regulations in a project manual. Private sector involvement is limited by the existence of firms operating in areas similar to those of the PEEIR. Except for Costa Rica, and to a certain degree, Panama, such firms are lacking in the Isthmus.

R - Develop means to follow up audits and energy savings results (R1 and R2).

C - These activities, also recommended in both reports, may represent an interesting market development opportunity for contracting technical services such as measurements and continuous monitoring. Therefore, in market oriented circumstances this may turn out to be one of the most important servicing activities to PEEIR.

4.2 Project Management

R - Involve Delegates and all level of PEEIR staff in the Annual work Plan design and progress reports reviews (R1). PEEIR staff should get more involved in all implementation related aspects of the Project (R2).

C - These recommendations still hold a high degree of validity.

R - PEEIR staff should work more closely with SIECA to promote available financing mechanisms and in suggesting policy initiatives to accelerate realization of energy savings (R2).

C - This is one of the weakest aspects of the entire PEEIR. Several institutional knots are creating key barriers that make it difficult to motivate industries for higher savings. No mechanisms to stimulate the interest for savings have been created.

R - Clarify roles of ICAITI Directors and project managers in project management (R1).

C - This still remains a crucial management issue. A Project Manual indicating tasks, responsibilities and authority is still lacking.

R - Increase authority of the project managers (R1).

C - Authority should be given to the Project managers in accordance with normal practices in a good matrix management. This is not yet the case.

R - Develop and implement a system for personnel evaluation and merit compensation (R1-R2).

C - This is also related to the problem of a lack of administrative norms and procedures (Project Manual).

R - Delegates and project managers should participate in budget planning (R1). Adequate financial reporting and budgetary control system should be designed and implemented (R1).

C. These procedures should also be included in the Project Manual referred to above.

4.3 Project Staffing

R - Engineers with above average performance should receive salary increases and bonuses and/or substantial nonfinancial benefits such as overseas training (R1).

C - This recommendation was formulated at the end of 1984 and still is valid today. Some kind of compensatory ways should be established by choosing the best options already suggested in the evaluation reports (including this one).

R - In 1985, the work on pilot projects should be limited to feasibility studies. Actual implementation is to be left for 1986 (R1).

C - The two pilot projects originally contemplated in the Project were supposed to demonstrate new technologies adapted to the Central American environment, within the five years of project life. These pilot projects were virtually abandoned in 1985 since no mention of them are made in the second evaluation report, nor in the 1987 plan of work. The time left for the Project and the efforts needed to implement them lead to the conclusion that this portion of the project is to be forgotten.

R - Increase the audits scope to include more emphasis on process modifications and capital intensive projects (R2).

C - This is one of the main thrusts of the present report's recommendation. However, in order to implement this recommendation to the fullest, several management preparations should be performed beforehand (as detailed in the previous sections).

4.6 Training

The recommendations on training of PEEIR staff have been fulfilled. However, in the First Evaluation, it has been found, as an important item, that management training was missing within PEEIR. No recommendation to that purpose was formulated in either evaluation.

This evaluation team considers training of fundamental importance, but with the observation that management training should involve all the relevant parties, i.e., all the ICAITI staff managers. This training should be part of a general organizational change to respond to the needs of the market in general (See PART 4.)

4.7 Promotion

The user training recommendations made were followed and satisfies relevant need. With the widening and deepening of PEEIR activities, new directions for this component would be expected.

4.8 Database

R - Contract a specialized firm to gather technical information at a faster rate.

C - Information should be gathered not only faster, but with a wider view on the energy technology front. A contract with a foreign energy data bank for supply of energy technology and data information is strongly recommended, such as the US Department of Energy database. The SIECA data bank should also be incorporated into ICAITI's.

4.9 Financing and Policy Issues

R - Develop a plan to monitor and use financial resources available from the sale of services to private sector, including possible use of this fund as seed money for national leasing/revolving funds to finance project implantation.

C - This fund is too small yet for such use. It is suggested that a study be done for the establishment of a special line of credit at CABEI to finance ICAITI to deliver turnkey energy savings projects to industry and commerce.

4.10 Project Impacts

R - Increase project scope beyond original targets, to include buildings and any large energy user (except refineries and power plants).

C - This should be valid, but only after very careful preparation on the institutional and policy aspects of ICAITI. However, in principle no discrimination of refineries and power plants should be contemplated beforehand because savings opportunities may turn out to be very significant in these two sectors. Sugar mills and coffee beneficiation plants should also become target markets for ICAITI.

V. THE RESULTS AND THEIR IMPACTS

5.1 Impacts

Over the four years of project implementation, its benefits can be appraised on various levels. At the most clearly identifiable level - energy audits potential monetary savings of the order of 10-12% were indicated. More specifically, the results of the Level 2 audits, of which 96 have been performed to date, can be summarized by industries and countries as follows:

	Total Value of Energy Consumed ($)	Potential Savings (Annual) ($)	Percent (%)
Chemicals	2,433,109	356,106	15
Food	9,544,267	447,335	5
Beverages	4,463,499	396,140	9
Textiles	1,569,664	194,145	12
Other industry	13,648,831	929,424	7
Services	1,244,292	56,529	5
Guatemala	8,996,010	930,324	10
El Salvador	4,734,214	464,993	10
Honduras	3,741,384	556,672	15
Costa Rica	1,939,863	261,507	14
Panama	13,492,211	870,068	6
Region	32,903,682	3 083 564	9

Source: SIECA

The information given above is, of course, a very rough measure of the impact of the project. Not all of the potential savings have been realized, because not all of the OCES recommended in Level II audits have been implemented. On the other hand, ICAITI has implemented over 150 audits or other energy interventions (e.g., those in which the firm did not desire a formal audit but did wish advice on a specific energy-saving problem which it had independently identified). Also, one should include energy savings obtained by project-sponsored personnel trained in seminars, training courses, international conferences and international fairs. Finally, some impact must be attributed to bulletins, manuals, energy-grams and other publications.

Concerning the degree of implementation of OCES, our survey indicates:

	% Implementation	
	Level I Audits	Level II Audits
El Salvador	50-100	0-100
Guatemala	50- 75	50- 75
Honduras	no data	50- 75
Costa Rica	no data	50- 75

Thus the evaluation team has concluded that $2 million in annual savings of energy costs by the project is a minimum figure. Extrapolating from the break out of imported fuels vs. electrical energy (twenty-five percent of the latter is derived from imported fuels) we conclude that PEEIR has accounted for savings on imported fuels of more than $ 2 million per year. The 1987 Work Plan sets the potential of accumulated savings at $11.1 million. The average saving during 1983 to 1985 was estimated there at $2.03 million per year.

5.2 Private Sector Involvement

It is not possible to estimate the number of firms affected by the project. Regionwide, in 1986, 290 persons attend ten seminars. Two more intensive courses (sufficient to transfer the skill necessary to perform an energy audit) trained another 85 persons from the private sector, and 10 from the universities and the public sector. There were also three feasibility studies of demonstrations and 39 follow-ups of energy audits. Energy-oriented publications were estimated to reach roughly 2000 business firms. There is doubtless considerable duplication and overlap in these statistics. It can be said that perhaps 1,500 to 2,000 private firms and state enterprises are receiving some direct or indirect benefits from the project.

5.3 Outreach Efforts

The data presented above represent a reasonably intense outreach effort by ICAITI headquarters. To this must be added the follow-up survey of energy audits performed in Guatemala by SISTEMAS. This study shows that the project has improved the professional image of the Institute -- 70% of the executives of firms participating in PEEIR activities have a high image of ICAITI's professional staff, whereas only 38% of nonparticipating firms believed that ICAITI staff were capable of performing the services it offers. This conclusion is reinforced by a sample survey performed in Costa Rica for this evaluation (of 34 participants in PEEIR workshops, seminars and promotion conferences). Forty-four percent of these persons reported implementing energy-saving changes as a result of information gained in this training. In El Salvador, although only 5 such participants were interviewed, it was noted that there was very little difference in implementation between firms which had received energy audits. In conclusion, outsiders training is more cost effective than audits (for ICAITI).

Also, the national Delegations have sponsored demonstrations and promotion conferences. In El Salvador, these activities have stimulated demand for energy audits by ICAITI. The standard approach to private firms is to provide a budget for the implementation of recommended OCEs. Upon submission, ICAITI makes a presentation in order to eliminate misunderstandings as to the meaning of recommended OCE's and to seek follow-on technical assistance and energy-saving measurements.

In El Salvador, only three audits are known to have been performed by the staff of CEL, trained by ICAITI, and by private consultants. In Guatemala, a half dozen firms have approached ICAITI for consultation on specific aspects of energy savings but did not want to pay for an audit. As in El Salvador, no one in Guatemala or Honduras has mentioned a private consultant who sold energy audits (other than agents for boilers or for water softening equipment, who perform demonstrations on the efficiency of their products for no charge). But there is some private enterprise activity in this regard in Costa Rica. This may possibly be linked with other engineering services.

From all this, we come to the conclusion that selling energy audits is a "hard sell" at this time in most countries of Central America. It could become even harder with small industrial firms, with less ability to pay for audits. Demand for audits could disappear altogether if the prices of the audits rose substantially without flexible and creative mechanisms to pay for the services. Hence they might have to be continued as "loss leaders". ICAITI discriminates as to prices of audits, based on overall energy use and seriousness of waste of energy based on plant visits, as well as ability to pay. But by and large, it tries to recover only 60% of the cost of energy audits.

Nevertheless, energy audits are an effective outreach tool at ICAITI's disposal, even if they now lose money and may become even more difficult in the future to market at closer to cost-recovering prices (for a more complete discussion of this issue, see Chapter III, above).

Another promising line of outreach is via the international development agencies. ICAITI headquarters have worked with UNDP's Regional Program of Technical Assistance for Latin America and the Caribbean, mainly in the area of proposals for regional systems of technical standards, norms and quality control; regional data bases' and regional quality control labs for both InterAmerican and extra-regional trade. These initiatives could lead to follow-on projects with other research institutions in other countries in the region. In this way, ICAITI may benefit from extension of its sources of technical information, and possibly gain opportunities to apply its expertise in a broader geographical area. Both bilateral and multilateral sources of funding might pick up the cost of a portion of this activity.

5.4 Components' Cost Recovery

At this time, neither energy audits, nor educational efforts and seminar, nor information services and technical publications, cover their costs. Cumulative through 1986, these costs break out as follows:

Components	(US$ 1,000)
Audits, demonstrations and follow-ups	1 586
Promotion, instructional materials	645
Data base	75
Seminar	163
Total	2,987

Roughly $ 131,000 have accrued in payments for audits and seminar, ($78,000 for audits and $53,000 for seminars). Thus there have been recovery rates of 5% and 32%, respectively. This figure under-estimates cost recovery in audits because it includes costs for demonstrations which unfortunately cannot be disaggregated. Although no demonstrations were done in the end, sensibly, preparation costs were significant. On the other hand, a major proportion of the budget for promotion and seminars should be charged to seminars. However, the figures for promotion and seminars combined account for half of that for audits and demonstrations. Although our data on implementation of OCE's by seminary participants are incomplete, it would appear that they are almost as numerous as those for audited firms. This suggests that seminars and promotion conferences have not only had higher cost-recovery than audits, but have also been quite cost-effective.

Energy audits are a means of getting a foot in the door, of selling follow-on services such as energy measurement and supervising the implementation of OCES, and ultimately, of a broad range of other services. The latter could be diverse. For example, an energy audit performed in a liquor distillery might result in the distillary paying for implementation of some of the recommended OCEs. Later, the distillery might discover that ICAITI has performed research on fermentation techniques, a subject that ties in well with their own concern with costly imported barley malting. The distillery may well be willing to pay for further help on this subject. The existing PEEIR staff would be unlikely to be able to provide assistance with malting, but it they are made to feel these branch-offs from energy will in the end justify ICAITI's involvement in the original energy audit, they may be motivated to arrange for a malting study by ICAITI. ICAITI, in turn, will need to be able to respond quickly to such a new situtation.

119

From these considerations, the team believes that energy audits, even though their unit cost is not yet cost-recoverable, should take priority over other PEEIR activities. They can be made even more cost effective by reducing the unit costs of audits. This reduction would involve:

(1) Retention only of staff of the highest caliber, during the next two years, as pointed out in the Section 3.3.7. Some difficult personnel decisions must be made, since reductions in force are never pleasant.

(2) Introduction of an incentive system by which both the audit staff and the PEEIR Project are rewarded for follow-on business of any kind, including energy audit follow-ups, for ICAITI. These incentives should not be charged to PEEIR but rather to general ICAITI funds. What could be envisaged is for the contract overhead to be shared between the audit staff and the PEEIR project.

(3) More effective use of the more highly qualified Delegations staff, under the supervision of headquarters staff, in preparing audits in a matrix management mode. The former have unfortunately been neither properly trained nor properly used by the Project. In the long run, their use could represent significant cost savings in performing energy audits.

5.5 Progress Reports Preparation and Dissemination

Annual reports are available in two formats:

(1) As sections of the Chapter on the Division of Industrial Technical Services in the ICAITI Annual Report,

(2) As an introduction to the Annual Work Plan for the following year.

The quarterly progress report is extremely brief and contains no analysis whatever.

The material in the ICAITI Annual Report is hidden in a document of over 200 pages, because it is combined with reports from all the Institute's divisions. This material is therefore unsuitable for policy-making purposes, particularly as the entire document is published with a time lag of over nine months. Nevertheless, some of this analytical material is not available in the Work Plan.

50

The 1987 Work Plan document, as might be expected, focuses to a greater extent on financial material and omits discussion of the activities of the Division not included in the project. This Work Plan (presented to ROCAP in December 1986) contains a number of proposals for changes in the project. For example, in its 1987 volume, ICAITI suggests to ROCAP that funding derived from energy audits, courses and seminars, some $131 000 to date -- plus $400 000 in project funds, be placed in a involving fund to be administrated by ICAITI for the purpose of financing the implementation of OCEs.

There are, however, very serious issues which have to be taken into consideration. Bankers are notoriously reluctant to lend against services, since there is no collateral with which to guarantee such a loan. Would this, therefore, oblige ICAITI to provide guarantees for commercial loans? If so, the Institute would be exposed to extreme risks. If not, how would this fund be any improvement, from the point of view of the borrower, over regular commercial credit? And if no better, would the fund move? And if the fund were not to move, how would ICAITI "assure the self-sufficiency of the project"? On the positive side, it has to be mentioned that, if some institutional mechanisms can make this fund a viable idea, it is expected the transactional costs for the clients could be low.

5.6 Environmental Impacts

The environmental impact of this project involves:

(1) More efficient combustion, thereby reducing hydrocarbon and carbon monoxide emission;

(2) Less overall combustion and hydrocarbons, reducing emission of nitrous oxide, sulfur and certain other pollutants. There is no basis for estimating the former effect. But one might attempt a rough calculation of the latter in the light of data on overall impacts presented above. The main industrial fuel is Bunker fuel, which has a very high content (up to and around 5% of SOx) of sulphur acids implying heavy local environmental burden. Reducing the atmosphere sulfur and nitrous oxide levels and the sulfuric acid content of rain in urban areas will clearly provide a benefit. In rural areas, however, the effects are more complex. Harmful effects of sulfur acids will be offset by the positive effects of the added sulfur to agricultural soils, which are generally deficient in this micronutrient. Bacterial action will convert most of the nitrogen compounds to ammonia and eventually to nitrates.

5.7 Conclusions

- Energy audits have reduced the consumption of imported fuels in the region by at least $2 million per year, perhaps by twice this figure.

- On the demand side, private sector involvement in the project is widespread; private sector attitudes toward the project are highly favorable. There is little private sector involvement in the service supply side.

- Outreach efforts by the project have been successful in stimulating demand for its services, but the same cannot be said for its impact on the demand for ICATI's overall range of services.

- None of the project components can be said to be self-sustaining. All of them must probably be subsidized if the present mode of operation remains unchanged.

- Project reporting is inadequate and confusing as to overall goals of the project and means proposed to reach them.

- The project has had a small favorable environmental impact.

5.8 Recommendations

- ICAITI must support and even subsidize PEEIR activities in the near future. This support/subsidy may take two forms:

  (a) More flexible pricing policy.

  (b) Rewards to individual PEEIR engineers who find new business for the Institute, either energy audit follow-on (measurements, supervision of the audit recommendations);

  (c) General support to PEEIR

- Our specific recommendation is that ICAITI establish an overhead charge for services sold through PEEIR. Of this, some percentage would go to the PEEIR engineer who sold the activity and to the PEEIR project.

- As to the future, PEEIR's destiny is closely related to ICAITI's, which in turn is discussed in Parts 4 and 5 that follow.

- Much can be done over time to reduce the burden of PEEIR upon ICAITI, by paring the PEEIR staff, retaining only the most outstanding engineers for performing audits, reducing overhead, and making better use of local staff. None of these steps can be taken in a crisis atmosphere, hence funding should be assured for PEEIR through 1989.

VI. PERFORMANCE OF SIECA

6.1 Introduction

This section reviews SIECA's performance, in the implementation of the Financial and Public Policy component of the project. The evaluation team worked closely with the Department of Physical Integration and other supporting departments of SIECA: Statistics and Calculations, Industrial Department, Fiscal and Tariffs, and the Center for Central American Studies of Integration and Development. Evaluation of activities included review of project documents, work plans, and interviews with technical and administrative staff.

6.2 Original Project Design

In the implementation of the Financing and Policy component, SIECA undertook studies with the objective of analyzing the policy framework, particularly financing, to encourage industries to improve energy productivity.

This role in promoting national policies can potentially have an important impact on industry's efficient use of energy, and in increasing the availability of financing options for implementing fuel efficiency and fuel substitution alternatives.

The basic objectives of this component as expressed in the Project Paper are:

- To identify public policies that act as disincentives to efficient energy use and to adaptation of alternative energy uses.
- To recommend policy changes and encourage their adoption.
- To promote the development of private and public sector financial and other support services that will facilitate and encourage the adoption by industry of more energy efficient production techniques.

6.3 Component Implementation of the Department of Physical Integration

The Department of Physical Integration is in charge of implementing the Financial and Public Policy component of theproject. Cooperation between departments is very effective in terms of services and information sharing. The project receives direct assistance from the Department of Statistics, which is responsible for compiling, processing and publishing of consolidated statistics for the five countries of the Common Market and Panama. The project staff and the Industry Department have close relations in areas of interest, such as industrial development programs, fiscal incentives and benefits provided to industry.

Staff members are well qualified in their respective fields of specialization. However, a very strong bias can be detected for dealing with engineering-technical aspects of the project, with detriment to policy issues. Only the expert economist has a more complete concept of public policies in the context of energy saving; but he is in charge of studies and investment, and is not involved in policy analysis. The policy component of the project is hampered by lack of orientation and knowledge of policy analysis.

The activities of this component were programmed according to the Project Paper. Annual work plans were prepared for SIECA by Hagler, Bailly & Co., with the assistance and participation of the project staff. No specific evaluation of this component has been carried out previously.

Work plans for 1985, 1986 and 1987 included the following activities:

Activities	Achieved Up to date %*
Public Policies	
1. Studies of the impact of current public policies	75
2. Study of the new Central America tariff structure. "Convenio Arancelario y Fiscal"	60
3. Identification of actions to overcome disincentives to efficient energy use.	50
4. Evaluation of previously identified public policies	0
5. Promotion	0
Financing	
1. Investment needs and financial requirements	75
2. Research on new financial opportunities	60
3. Evaluation of existing loan programs and capital sources	75
4. Identification of measures to improve access to credit	50

* Percentage provided by SIECA, based on subjective judgement.

These activities adequately reflect the objectives of the project; however, the level of the programmed effort for each year has surpassed the capacity of the available personnel. For this reason important activities, such as evaluation of identified policies and their promotion, have not been carried out.

Regarding public policies, SIECA prepared 34 documents, some existing only in draft, on the following topics:

Subject	No. of documents
- Diagnosis of the energy sector in Central America	5
- A survey of the behavior of the energy sector in Central America	5
- Socioeconomic research on the countries of the area	5
- Research on fuel substitution	2
- Research on energy balances in Central America	2
- Price policy and tariffs in Central America	5
- Study of the prevailing legislation regarding energy	5
- Studies on External Common Tariffs in Central America	5

In spite of the abundant number of documents published, research and analysis of policies and their effect in the use of energy are not fully developed. This shortcoming is basically due to a lack of methodology to define and orient the research, and absence of empirical verification.

With respect to the financing area, SIECA prepared 17 documents on the following subjects:

Subject	No. of documents
- Analysis of financing possibilities	9
- An estimate of requirements for investment	2
- Mechanisms to accelerate financing	5
- Funds to finance projects	1

In this area the documents present a higher degree of consistency and analysis, and are directed toward the basic problem of financing efficient energy use. However, they fail to come to clear and comprehensive conclusions.

6.4 The Results and their Impacts

The main results of the SIECA studies can be summarized as follows:

On Government Actions:

- The electric systems in Central America are well consolidated and the supplies are guaranteed for the next five years. This is due to the fact that in view of the price increase of fuel, all countries promoted the construction of high capacity hydroelectric plants.

- The study on the tariff structure shows a great variation in the criteria of application among the different countries of the area. A deeper analysis of this structure could lead to important recommendations not only to eliminate barriers to more efficient energy use, but also to encourage it.

- Private production of electricity is still at a small scale, but it is cheaper than that of the government because it uses vegetable residues such as sugar cane bagasse, sawdust, coffee and rice residues. It would be convenient to extend the incentives to promote this type of generation. Cogeneration should be examined very carefully.

- Regarding the price of energy, it is indicated that all countries of the area have followed the policy of subsidizing the consumption of kerosene used directly by low income groups. At the same time, the price of diesel fuel is subsidized with the purpose of promoting industrial development and cheaper mass and food shipment. It is convenient to extend the analysis to the implications of this subsidy in the saving and efficient use of energy in general, and in industry in particular, and its relation to oil refining structure.

- The SIECA studies propose the viability of substituting the use of oil for local fuel available in the region (such as the vegetable residues described before). This conclusion implies fundamental changes in the physical plants of industries, more technological research is therefore needed to make recommendations in the public sector policy area.

- There has been the recent adoption of lower tariffs in the Common External Tariff. This approach may help in attaining the objective of increasing efficiency in energy allocation. However more analysis is needed on Effective Rates, including estimates of the effect of several export promotion measures. For example, one of the inefficient uses of energy comes from the fact that local producers of machinery and parts have to buy their inputs (from local or imported sources) that operate under the protection of prices higher than those of international market.

- Studies are needed also in the areas of general industrial policies, efficiency standards and norms, institutional issues and technology transfer, geared toward higher energy efficiency.

On Financing

In the area of financing, the main results consisted of the presentation of proposals to the Central Banks, asking for the inclusion of financing for the projects of energy efficiency, using resources of the loan programs presently available, be these of internal or external origin. Up to now there are not firm results on these proposals, and a period of negotiation and study of the mechanisms for applications can be anticipated. These proposals neglect one basic issue regarding financing, namely the transaction costs in financing energy savings projects. It is convenient also, to perform conclusive studies on the actual demand for financing this type of projects, including their requirements and characteristics, while at the same time, broadening the possibilities of financing by CABEI.

6.5 Progress Reports

SIECA produces trimestral reports and a yearly report forwarded to ROCAP and ICAITI. These reports are basically on administrative issues.

Technical reports have not as yet been developed to summarize the conclusions of research and analysis, and to present them in an integrated fashion. Therefore, one of the aims of this component has not yet been reached: documentation regarding better policies and supporting services for policy makers, planners, investors and donor institutions.

VII. ENDING OF THE PROJECT

7.1 General Strategies

In this chapter, we appraise the consequences for the PEEIR Project of various tactics for termination of disbursements by ROCAP to ICAITI and SIECA. Management and other needs, and their implications in relation to the options sketched here, are discussed in Part 4 of this report. With regard to ROCAP support for ICAITI's future level of PEEIR activities, there exists a range of options interrelated with broader issues of strategy and management of the Institute. The options are addressed at length in Part 5 of this report.

Options for ROCAP Concerning ICAITI

- Immediate phase-out - no extension of PEEIR after year end 1987 (Option zero).

- Extension of financial support of PEEIR for one year.

- Extension of financial support of PEEIR for two years (Option A).

  Extension of financial support of PEEIR for two years complemented by additional core support or new project funding (Option B).

7.2 Discussion of Possible Impacts of Phase-Out Options

As indicated above, the major determinants of industrial use of energy are the level of economic activity in the sector and energy price. After almost 10 years of a depressed market, there are indications of revived industrial growth at this time. The survey made by the team detected a number of firms operating near capacity, investing in new equipment, or even expanding capacity. The survey has also shown that the implementation of OCE's in Guatemala and El Salvador are being accelerated through the adoption of higher efficiency equipments incorporated into plant expansions.

Engineers conducting energy audits have indicated a growing interest on the part of their clients for broader audits focussed on processes as a whole, due to these clients' need for increasing overall productivity. The implicit requirements of such work include more staff able to do the process audits apparently in demand by industry. Such work does represent a natural bridge for ICAITI to productivity interventions, providing an effective means of determining private-sector demands for other services.

7.3 Discussion of Option A

The Team considers that the internal policy and management problems of ICAITI are such that a simple extension of the Project would not be sufficient to permit the Institute to overcome these problems. By failing to provide proper incentives, it could actually be harmful, overall, to ICAITI. Thus the Project should at the same be modified so as to permit:

- Reorientation of the Institute toward serving market needs
- Emphasis on strategic planning
- Reorganization of the Institute's current structure
- Major staff reassignment and training throughout the Institute, so as to facilitate more effective project functions and program management.

The actual strategies recommended in this regard are discussed in Part 4, below. They would involve some expenditure of funds on outside experts, consultants, and staff training. The Team feels strongly that the use of PEEIR money for these purposes could be counterproductive, however, unless preceded by specific agreement with ROCAP as to goals and methods by which to achieve them.

7.4 Discussion of Option B

Even if the above processes could be commenced and perhaps carried well along during the final two years of implementation of the PEEIR project, it is unlikely that the financial support on this scale and within this time frame would be adequate to achieve the transition. The needed changes would probably require greater donor leverage and assistance, and more than project type financing. Thus, Option B proposes that ROCAP develop a project for core support or other project activity. This would both increase ROCAP's leverage and facilitate desired reforms.

7.5 Termination of SIECA Participation

It is expected that by the project termination date (December 31, 1987), SIECA will have prepared a summary report (or reports) integrating in a usable form, the main results and information obtained. However, it is unlikely that efforts to implement improved financing mechanisms will be fully in place by this time, for reasons in part beyond SIECA's control. It also appears that the body of policy work to be summarized still has not focused adequately on the issues raised by a program of energy-economic rationalization such as PEEIR. This may in part be due to historic reasons, as raised in Part I. SIECA's energy agenda is broader and includes a strong supply-side emphasis as well.

It is recommended that an extension of six to twelve months be granted to SIECA during which time:

- there be a concentrated effort, with increased coordination with PEEIR/ICAITI, on policy issues directly relevant to the rationalization of energy use (including cogeneration);

- efforts at implementation of improved financing mechanisms be brought to fruition;

- alternative funding be obtained for continuation of SIECA's traditional broader energy policy work.

Unspent but obligated project component funds exist which could be used for this purpose. To assist especially with the first item above, it is recommended that an experienced energy economist with international experience in demand-side policy issues be contracted to help set the agenda and work out appropriate methodologies. Capability on this side still appears to be inadequately developed at SIECA.

7.6 Closing-Out Actions

Documentation requirements of PEEIR, with the exception of the electronic data base, have been well implemented during the life of the project and could be closed out at minimal cost. The data base is in the process of being integrated with ICAITI's general data base. A final technical report must be prepared under any of the options listed above, listing auditing methodologies found most successful, OCEs found most easily implemented, and other professional matters.

Since much of the technical staff was hired specifically for the project and subsequently incorporated into a contributory pension and terminal pay system, the financial cost of their termination could be easily absorbed by the project. Hopefully, some of them would be picked up for other ICAITI's services or by existing consulting firms interested in providing their services for a profit (and to which ICAITI could direct potential clients). The closing-out actions are strongly dependent on the final outcome of the choice of the options as laid down in Part 5. The costs of closing out actions could be much higher than actual financial costs.

16

VIII. RECOMMENDATIONS

ICAITI

A. PEEIR should be extended and broadened in scope, as outlined in Option A of this report.

B. The Regional Advisory Committee should be modified to include key national level institutions, and should meet more often, perhaps twice per year. It could provide the nucleus of an Institute wide-advisory body as discussed in Part 4.

C. More authority should be transferred from the Division Head to the Project Manager and from this to the assistant managers. With the expansion of the scope and life of PEEIR, management authority and task distribution within the project will need redefining within the context of the overall institutional management audit recommended in Part 4.

D. Delegates should be more integrated into PEEIR policy development. An effort should be made to decentralize service delivery gradually via the delegations (including using outside skilled consulting capabilities) even if this is somewhat more expensive in the short-term. Delegate relationships with PEEIR/headquarters should be analyzed in this light, in the institution wide management audit, recommended in Part 4.

E. To achieve this, a new set of objectives must be defined, together with corollary services and activities, and organizational changes.

F. A more flexible and transparent pricing policy is necessary. Alternatives to the current practice of up-front billing should be developed.

G. An incentive policy should be developed, within an institute wide context, to reward professionals for superior performance - including successful marketing of audits, follow-on, and other services.

H. Follow-on to audits and with seminar participants should be intensified both to better evaluate impacts and to develop new markets for technical services. Procedures for such follow-on activity will need to be developed.

I. A Project Manual of administrative norms and procedures should be developed. Improved financial reporting more adequate for controlling the evolving component tasks should be implemented.

J. Increase PEEIR training in management and subjects relevant to increasing scope of audits. In designing training delegation needs should be considered as well as other ICAITI divisions as discussed in Part 4 and Options A and B.

SIECA

K. SIECA's funding from PEEIR resources should be extended 6-12 months.

L. An effort should be made to concentrate policy analysis on issues directly related to increasing the efficiency of energy use - (If it is assumed that a summary document of work till now will be produced by December 31, 1987) with more coordination with ICAITI.

M. To this end, an energy economist with strong international experience in demand-side issues should be contracted on a short-term basis to help establish agenda and methodologies.

N. Efforts to improve financing mechanisms should continue.

FINDINGS

PEEIR

1. Numerical output targets for components were achieved, at less than budgeted cost. Impact, though, is hard to measure in energy term. Follow-up, a necessary basis for impact analysis, has been inadequate, though latest information suggests that it is improving.

2. The original design of the project was highly promotional in nature, and evaluation emphasized attainment of measurable output indicators. The subsequent shift to emphasis on cost recovery represented a strategic change, going often in an opposite direction in terms of management objectives.

3. The audits's potential savings identified have been close to those originally targeted (11%). The OCE's have emphasized minor plant modifications with low investments and rapid payback. Only recently has there been some move towards deeper audits involving process change.

4. Implementation of OCE's has been quite high and is increasing over time, even without any financing mechanism. This is due to the generally noninvestment intensive nature of OCE's. When larger investment OCE's become more important, financing will become a problem. There are varying perceptions of the difficulty of financing larger OCE's.

5. There has been significant impact from level I audits and seminars leading to savings (very difficult to estimate).

6. Although project emphasized petroleum conservation, OCE's have rightly been for all energy vectors and also involve substitution.

7. Significant interest identified in commercial sector.

8. The change in service pricing policy has been clumsily handled. The need for such a change was foreseen in the project paper. Evaluation of potential cost recovery of audits is complicated by inappropriate up-front payment scheme; ICAITI is currently trying to implement.

9. Generic administrative problems of ICAITI have complicated execution of PEEIR and relations with delegations.

10. Effective SIECA contribution to PEEIR has been negligible.

11. Project appears to have been cost effective as a whole, despite falling well short of original economic savings targets of project paper. Judgement of PEEIR in relation to these targets is inappropriate, since they assumed strong economic growth in region and fuel oil at $35 per barrel.

163

12. The seminar component has achieved higher cost recovery and also appears to have been cost-effective. Both senior management and technically oriented seminars have been useful.

13. Costs vary from country to country. Not clear decent would reduce costs, but other factors should be considered.

PART 4
GENERAL EVALUATION OF ICAITI

PART 4
GENERAL EVALUATION OF ICAITI

I. THE DETERMINATION OF STRATEGY AND POLICIES

ICAITI faces a critical transition period in its institutional history. The two ROCAP financiers projects have, in recent years, accounted for more than half the institutional annual budget. Scheduled end of the FWAE project and the possible termination of the PEEIR project could push ICAITI into a budgetary crisis almost unparalleled in its history. Unfortunately, ICAITI presently is not adequately prepared to deal with this crisis. Some of the causes for this incapacity and suggestions for improving the capability are outlined below.

1.1 A Reactive Operations Mode and Lack of Strategic Planning

ICAITI has lacked longer-term strategic planning. No major and systematic examination of what the institute's agenda should be and how that agenda might be implemented exists. The last major strategic planning exercise took place in 1972. Rather than defining an agenda to meet particular needs of the region, ICAITI has taken a more reactive posture. The agenda and priorities have largely been defined by a combination of major donor financed projects and requests for assistance that come in from the region. The vast majority of requests have come in the door unsolicited; ICAITI does little formal marketing and business development (see discussion in Section 2.1 below).

In the case of donor financed projects (the large majority of which have been through ROCAP), the initiatives for these efforts came largely from the donors. Only in the area of some relatively small applied research projects has ICAITI recently been active in seeking and competing for funds. ICAITI must evolve a more active role in both defining its agenda and marketing its capabilities. A medium term strategy is necessary for the Institute to identify its basic roles, and to develop the necessary additional capabilities and sources of financing to fulfill them. Part of the institute's problem comes from a poor communication mechanism with the member governments.

1.2 Inactive Governance

The governance structure of ICAITI is a Board of Directors which consists of the Ministers of Economy of the five member countries. ICAITI's founding statues allows the Board to delegate a great deal of authority to the Director. In recent years, the Institute has suffered from a lack of high-level governance. While the region's Ministers of Economy have met to deal with various matters, the Board itself has not met in almost 10 years. Nor, has there recently been any significant

degree of interaction between the Board members and institute management or staff with the exception of some interaction with the Minister of Economy of Guatemala. ICAITI needs a stronger guidance from the government of each of the member countries, to enhance its identity as a regional entity and to know and satisfy properly the real needs of such countries within the scope of its technical role.

It is a priority that the communication between ICAITI and the Board of Directors be improved for ICAITI to receive a strong and proper support and guidance in this critical period it faces. The question of the Board's composition should also be considered. Given the nature of the activities for which ICAITI has some inherent comparative advantage, the evaluation team feels that it may be more appropriate for the responsible representative from the member countries to be the Minister of Industry (or the Minister that holds this portfolio). It is unclear what administrative or legal adjustments this change would require (including the implications in terms of the inter-country agreement/treaty ratifying ICAITI's organization and governance). These issues should be examined. This is a politically sensitive but important issue where ROCAP assistance could be useful. For example, ROCAP could sponsor a special study of Board composition and acceptable alternatives which would effectively improve member country participation.

In addition to governance (and guidance) from the government representatives, there appears to be a role for a high-level advisory board that treats the Institute as a whole (as opposed to the committee currently advising the PEEIR project). This board should meet more frequently than the governing board. Its composition should include key elements of the business (especially industrial) community as well as elements of counterpart organizations. Besides serving as a conduit for the needs and perceptions of the market to reach ICAITI's potential services, the operation of such a board can promote a sense within the business community that ICAITI is there to serve them. This advisory board also should strengthen the process of strategic planning.

1.3 The Need for a Transition Period

Diagnostic work in this evaluation, including analysis of funding possibilities, suggests that the near term (say a 3 to 5 year period) should be regarded as a transition period during which ICAITI undertakes a number of necessary changes. Among the necessary changes are the following:

- clarification, completion, improvement and approval of an organized set of administrative procedures;

- introduction of basic changes in the policy process, especially at the beginning of the transition period;

- establishment of strategic goals and definition of operational objectives;

- introduction of inter-related administrative, structural and human resource changes, to make ICAITI organizationally adapted to operational objectives defined above;

- development of technical capabilities are developed, where necessary, to match objectives; and

- development for improved incentives for personnel.

Aspects of these needed changes are discussed in some detail in the following sections. Subsequent points in this evaluation report will have the idea of such a transition period as a back-drop. Two changes that should take place early in the transition period are outlined immediately below.

1.4 The Needed Strategic Plan for ICAITI

During the transition period a strategic plan must be developed. The Institutional strategy should take into account the following factors:

- Associated governments' industrial and economic policies and priorities for regionally supplied services;

- Private industrial community's markets, problems and priorities as they appear to be evolving;

- A clear definition of the menu of products/services that ICAITI is capable of delivering and other products/services that are logical extensions of existing services;

- ICAITI capabilities and role in relation to other industrial service institutions, (national or regional, public or private);

- Program and financing from international development assistance sources;

- Foreign institutions available for technical assistance or collaboration - private or public sector; and

- Institutional strengths and weakness.

1.5 A Needed Market Analysis

Other efforts should be undertaken during the transition to complement the strategic planning exercise. This evaluation has tried to point a possible direction for a basic transition within ICAITI. The process of carrying out the transition and identifying concrete operational objectives will require considerable analysis, including an analysis of the market for potential services.

During this evaluation, an initial sense of the market for ICAITI services was developed, as many of the direct beneficiaries (audits and/or FWAE demonstrations) were queried about (among other matters) what other problems their firm was facing and for which they might need assistance. The preliminary response is that an overwhelmingly large market for other services exists. The implications of these inquiries are discussed under future strategies for ICAITI in Section 4. However, it can be stated here that a more extensive market survey should be undertaken. This market analysis should cover:

- specific business needs to incorporate technology for new or improved products and processes. These will be related to overall economic policies as well as micro-economic and management changes (e.g. quality control issue);

- capacities for the provision of technical, management, and training/educational services within other regional and national institutes and other public/private organizations. Areas to avoid, areas where gaps exist, and places of collaboration should be identified;

- the opportunities in Central America for vocational and professional education and training, including needs, existing programs and capabilities. Areas to avoid, gaps, and places of possible collaboration should be identified;

- an inventory of external institutions recently involved in technical or industrial analysis in Central America;

- donor programs including characteristics of project operations in relevant areas; and

- technological needs perceived by the public sector (e.g. lack of appropriate scale road repair equipment).

II. MARKET ORIENTATION AND SELF-SUSTAINABILITY

ICAITI has established itself as a relatively reliable executor of donor projects. It has become a project-implementing organization. But it does not operate under anything near commercial standards. It has little market orientation, inadequate or ill-defined policies of pricing and cost recovery, and inadequate cost analysis and cost control to support such policy development. And yet there is an overwhelming need for such orientation if ICAITI is to meet more of the needs of the region. And there is a need that this orientation be a very dynamic one. ICAITI should be continuously entering new areas to fulfill the evolving needs of industry for technical services. At the same time, it should be leaving those areas that begin to be served by other private and public sector entities. Some of the particulars of the market orientation and self-sustaining issues are discussed in the following section.

2.1 Characteristics of the Lack of Market Orientation

As stated above, there is currently little market orientation within ICAITI. The lack of market orientation can be noted in a number of areas, including lack of appropriate processes and incentives (as discussed below). Amongst the areas that must be improved are the following:

- identification of client and potential client needs and definition of client characteristics,
- adoption of service and product delivery capabilities to meet these needs,
- marketing to make potential clients aware of these capabilities and how they can be used for their specific needs. (The evaluation team found it very common for clients or counterpart institutions to have a very limited idea of the range of ICAITI's service capabilities),
- marketing back-up capability: professional level proposal and bid preparation and "packaging" of promotional information on products/services,
- procedures for contract writing (legal as well as commercial aspects),
- follow-up, a fundamental marketing activity (this shortcoming has been mentioned by PEEIR and FWAE clients),
- ability to respond in a timely and accurate way to opportunities that arise, including negotiation of prices for the delivery of services.

2.2 Pricing and Cost Recovery Strategies

The lack of well designed pricing and cost recovery policies has been discussed at length earlier in this report in the context of both the FWAE and PEEIR projects. These discussions (e.g. Part 3, Section 3) indicate the generic nature of this problem and include recommendations for improvement. The non project specific discussion below notes some additional issues, and summarizes the points made in the earlier discussions.

Any pricing/cost recovery policy needs to be based on a detailed understanding of the various direct and indirect cost elements that go into providing the particular service. The lack of detailed cost analysis and an appropriate overhead structure has been noted in previous evaluations. On the positive side, progress is reportedly being made and there have been changes in the overhead loadings. However, the estimation and categorization of costs, the creation of cost centers and the development of needed procedures are not yet evident. Procedures for allocating certain cost pools must be developed. Procedures appropriate to the different types of services being, and likely to be delivered, need to be developed. Some additional comments regarding overhead costs are presented in the subsequent discussion of administration and management issues.

The possibility of self sustainability either on a cost center basis or for the institution as a whole is dependent on the financial capacity of the client beneficiaries of ICAITIs services. There exist significant differences between client groups and types of services in relation to the potential for cost recovery from direct beneficiaries. Categories with very limited potential (in near term) are:

- households or unorganized groups;
- small and micro-business; and
- isolated analyses.

Simple audits, seminars and publications are a marginal case of cost recovery potential. With respect to cost recovery, overall marketing and business development strategy should be concentrated on clients and activities where direct beneficiaries are capable of paying for full costs, or where some other institution will bear this cost. As discussed earlier, this latter alternative is an important option for activities that build from the FWAE project. In principle there is no reason why all activities should have full cost recovery from direct beneficiaries. The mandate of ICAITI clearly involves activities where this objective would be unrealistic. In areas where direct beneficiaries cannot pay full costs the strategy should be to diversify sources of compensatory funding such as:

- AID mission projects;
- other donor sources; and
- increased country support.

ROCAP could play an influential role in assisting ICAITI to capture such sources of financing.

In addition, cost recovery on some activities should be evaluated within an overall marketing strategy. A good case is the set of technical services activities. While on the whole these have relatively high cost-recovery potential several key activities can be seen as "loss leaders" which serve to stimulate broader demand. PEEIR audits, for example, have proven to be an excellent opening to industry. A well-done basic energy audit establishes credibility and has been shown to establish business interest in assistance for direct needs identified as well as other kinds of services. A strong follow-up strategy may be more productive for overall self-sustainability than an attempt to immediately achieve full cost recovery on audits. On the other hand, both full cost recovery on audits and successful follow-on may be feasible.

A clear and consistent policy is critical. Industries do not like to learn that competitors received similar services for less. ICAITI must establish and maintain its own internal systems for quality control and post-service evaluation of customers satisfaction.

It is important to distinguish cost-recovery from cost-effectiveness. PEEIR, for example, appears to have been cost-effective. Isolated analyses may be cost effective, in that they contribute to disciplining and calibrating a whole quality control laboratory system. But neither ICAITI nor PEEIR has come close to recovering total costs.

III. ADMINISTRATION AND MANAGEMENT

There are a number of areas of the administrative and management structure and process within ICAITI that require change and/or improvement. Many of these areas have already been explicitly or implicitly mentioned in previous sections of this report. Some of these administrative and management issues are discussed in more detail in this section, along with additional matters requiring attention. The matters requiring improvement and/or change may be grouped into two broad categories: those dealing with the institution as a whole; and those dealing specifically with the interrelations between the delegations and headquarters. Suggestions for changes in institutional, administrative, and managerial matters is made against a brief review of the existing organizational structure.

3.1 General Administrative and Management Issues

3.1.1 Present Structure

ICAITI has seven divisions and one Gerencia (management unit). Table IV-3.1 lists these units, and includes the number of personnel assigned to each and its operating budget for 1987.

The total number of professional and technical staff is 78. They are experienced in several areas of mechanical engineering, chemistry, industrial engineering, and economics.

3.1.2 Administrative and Organizational Characteristics

The main shortcomings of the administration of ICAITI and its organization can be grouped as follows. The flaws came both from organizational evolution resulting from the PEEIR and FWAE projects and evolutions that reflect other organizational history. Amongst the shortcomings are:

(1) The divisions and the Gerencia are tightly contained administrative units. Their managers run each unit quite independently. They are separated from each other by areas of activity and very little communication or interaction takes place between them.

(2) Table III-3.1 shows the unbalanced distribution of the number of personnel among the divisions. The three first divisions have less than 10 persons each, including the secretarial support personnel, while the three main divisions each have up to five times more personnel each.

(3) The Divisions of Technical Edition and Documentation and Information are too small in personnel and narrow in task attributes to merit Division status. The same criticism is applicable to the Division of Norms and Standards.

TABLE IV-3.1

DIVISIONS AND PERSONNEL AND OPERATING BUDGET BREAKDOWN OF ICAITI

	Divisions	Personnel (*)	Operating Costs (US$ 1986)
1.	Division of Technical Edition	7	
2.	Division of Norms and Standards	6	53,100
3.	Division of Documentation and Information	8	23,000
4.	Division of Technical-Industrial Services	41	1,215,200
5.	Division of Analysis, Testing, and Measurements	14	149,500
6.	Division of Applied Research	45	433,300
7.	Division of Budget and Cost Control	14	(Indirect support: 181,500)
8.	Gerencia of Administration and Finance	57	
	Total	194	1,874,100

* Includes temporary contract personnel.

(4) Within the present organizational structure, the Director of the Institute directly supervises the activities related to library, technical editing and normalization, which do not require top management abilities. His time could be better used for broader tasks such as the Institute's external relations and policy issues.

(5) The present Acting Director is also the Chief of the Division of Technical-Industrial Services (STI) and the Deputy Director. This puts unnecessary administrative burdens on his shoulders, especially since the STI Division holds the important PEEIR and the FWAE Projects.

(6) Several ICAITI managers, including the ones in charge of the PEEIR and the FWAE Projects, hold academic positions in the local universities. Although this could enhance linkages with local academics it might affect their performance at ICAITI.

(7) There are no approved general administrative norms and procedures clearly stating the tasks and responsibilities of the managers and their subordinates. These norms are especially important for governing the relations between the Delegates, the project managers, and line managers at the headquarters.

(8) There is no clear definition of project manager authority and responsibility. This lack makes them extremely vulnerable to line manager restrictions.

(9) There is a lack of systematic norms and procedures for reviewing personnel performance. In general personnel incentives are weak.

(10) The lack of clear administrative norms and procedures regulating tasks, responsibilities, performance evaluation, communication flows, etc., has led to a series of difficulties including the "two boss" problem (between the managers of PEEIR and FWAE, and the country Delegates).

(11) Neither rules and regulations nor established policies exist in a systematized format in regard to very important issues such as marketing development, services contracting, industrial policy and, above all, general strategy.

Therefore, it is of utmost importance that an in-depth study on the administrative organizational and managerial aspects of ICAITI be performed and improvements implemented in the areas mentioned above. The resulting reorganization would be expected to result in significant increases in ICAITI self-sufficiency, efficiency and productivity. It should be observed that present ICAITI management has expressed strong interest in improving ICAITI organization and management systems and, in fact, has taken an important preliminary stop by contracting with an outside firm to review salary and position structure in the institute.

3.1.3 Organization Changes

Modern research institutions similar to ICAITI, worldwide, prefer to use the matrix mode of organization to perform project operations. In this mode, effective time-sharing of specialized personnel and the development of specialized skills in the core staff are enhanced. However, a complete knowledge and acceptance of the ways and the means to operate an institution in the matrix mode is essential, especially among ICAITI's top management. Once the matrix mode is fully operational, and it is governed by well defined and simple administrative procedures, it should lead to significant improvements in the administrative performance of ICAITI.

The existing management mode of PEEIR (within ICAITI) resembles the atrix mode but lacks several fundamental attributes:

(1) The manager of PEEIR does not hold the power and the responsibility that has to be delegated to a Project Manager in a matrix administration. The Project Manager should hold full control of schedules, costs and the personnel involved. At present, the PEEIR manager holds full control only of the schedules. The rest is controlled through the utilization of the power of the Director who happens to also be the Manager of the Technical-Industrial Services Division. This results in an administrative distortion in terms of ICAITI as a whole. The Director's time could be better used for more important tasks of overall Institute administration, policy, etc. On the other hand, a suitable increase in compensation may be appropriate for the Project Manager if his responsibility is increased (and he/she would be expected to dedicate full-time to these responsibilities).

(2) As defined by the Project Paper, the PEEIR manager at ICAITI is in charge of managing four components of the PEEIR. The fifth component, Financing and Policy Issues, is in SIECA. The project expenditures for SIECA's activities are paid directly to SIECA by ROCAP. This could explain the weak integrative link between ICAITI and SIECA in regard to this project. As pointed out previously, this link represents a crucial point in the critical path of the Project, i.e., the need of policy incentives to push for a higher degree of implementation of the OCEs identified by ICAITI.

In view of the aforementioned facts, there is a need for basic structural changes in the organization of ICAITI. As mentioned earlier, it is suggested that a thorough organizational/management study be done and that matrix organizational structures be considered. In the absence of a more detailed study the evaluation team sketched

out one possible organizational structure which incorporates the following illustrative principles:

(i) A smaller number of divisions, permitting greater integration of functions and planning.

(ii) Within this reduced number, creation of a division that deals with the market, a business development division. Included in this division should be the national delegation offices.

The candidate reorganization scheme is presented in Figure IV-3.1. It must be noted that this reorganization scheme is only illustrative and based on limited work by the evaluation team. The suggested detailed organizational and management study might suggest different changes. The team's illustrative structure has the following advantages:

(1) It tries to preserve and incorporate all of the presently existing laboratories and administrative units by reshuffling them, and adds new functional organs to widen the present technical capability.

(2) It simplifies the basic tasks of the Institute's administration, giving to the Director the task of attending to only 6 Division Heads.

(3) The Department of Administration and Support centralizes all the administrative and support services. This includes the Library and Publications, personnel, legal, contracts, procurement, communications.

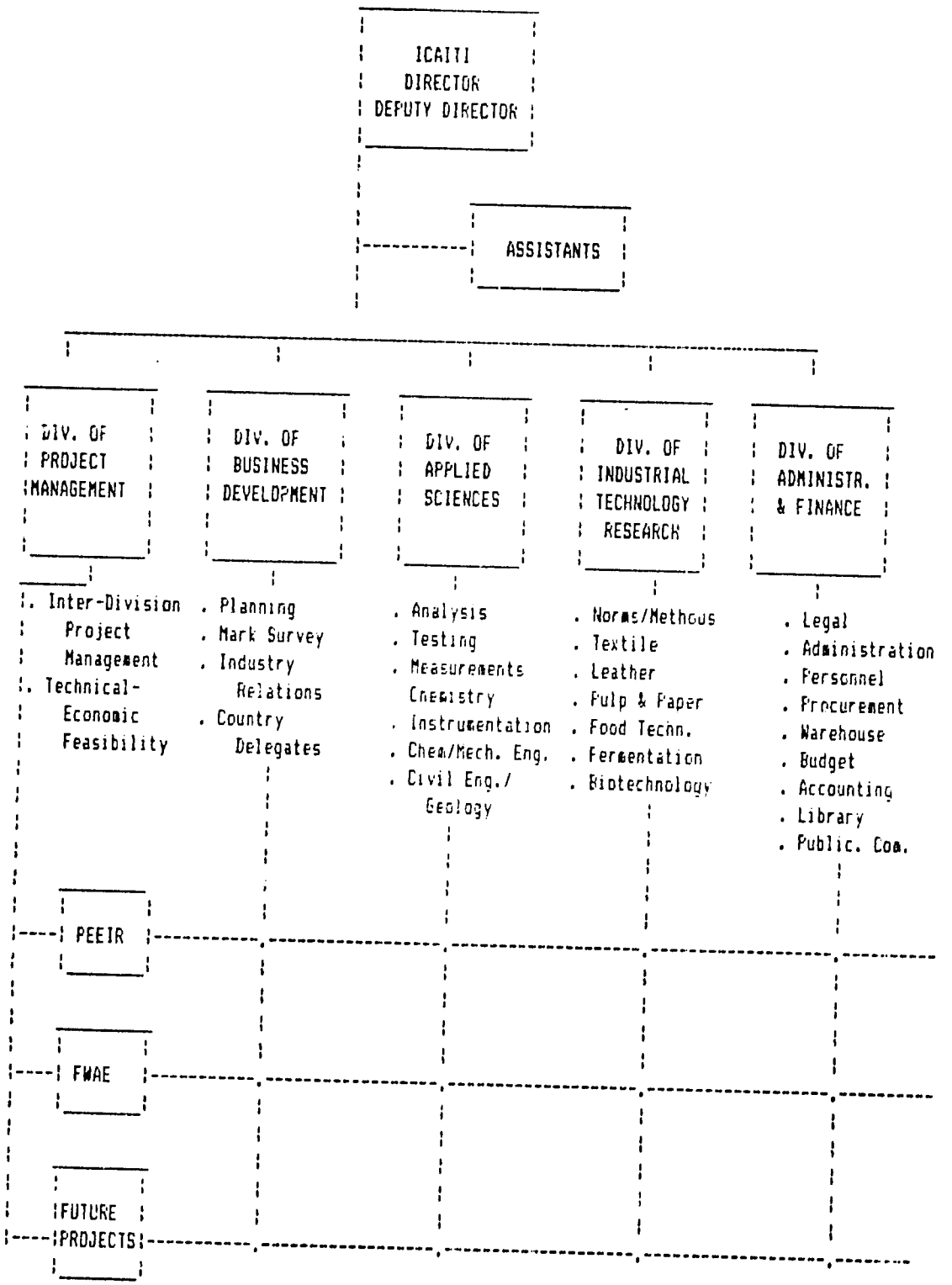
(4) Technical activities were divided into two Divisions: one, geared toward basic technologies related to testing, measurements and analytical physical-chemistry, engineering, norms, methods, and geology; and the other with specific industrial technologies and services.

(5) A Division of Business Development is proposed to be created to explore the potential market for technical services and other business opportunities that can enhance the degree of self-sustainability of ICAITI while promoting and providing the needed general technical services to industries, governments, and other sectors of the economy in the Isthmus.

(6) Technical services, in general, can be intra-division and may be managed in a matrix format within the concerned division. However, all multi-divisional projects such as PEEIR should be run by Project Managers responding to the head of the Division of Project Management. These Managers should be entitled with the power appropriate to their own responsibility and task. This power should include the control over the cost, schedules and allocated manpower, and participation on personnel evaluation and compensation merit ratings.

FIGURE IV-3.1

AN ILLUSTRATIVE EXAMPLE OF A NEW MATRIX ORGANIZATION FOR ICAITI



(7) The line managers should care for the development of their personnel capability within their specific specializations, through training and research and development activities. They should allocate the adequate personnel to Project Managers, in a judicious and preestablished way, and provide full support. The allocated manpower to a project should be managed solely by the corresponding project manager.

3.1.4 Consultants versus Staff and Related Incentive Matters

Given the need to be more market oriented and to be dealing with a dynamic agenda of needs in the region, it is important that ICAITI evolve personnel and related incentive policies that give it more flexibility to respond to the evolving market needs. This requires that ICAITI not be locked into long term staff commitments that overly constrain its capacity to respond to the market. At the same time these policies must be sufficient to attract and retain personnel who can best thrive in such a dynamic market environment. The approach taken by other institutions (public and private) faced with such market dynamics is a mixture of permanent staff, contract staff and consultants. It is the experience of other institutions that the greater the uncertainties or dynamic shifts in the market environment the more reliance is placed on the latter two personnel categories. Often it is necessary and appropriate for personnel in such nonpermanent categories to receive higher compensation than permanent staff of comparable experience and expertise.

ICAITI has long relied to some extent on outside consultants to supply specialist skills. Strategies leading to a more dynamic relation with the market, and diversification (such as that sketched in this report) would benefit from the more systematic use of extramural talent especially from Central America. (The possible use of firms through subcontracts could also be beneficial and is noted later.)

The process of matching internal know-how resource capabilities and incentive policies to market needs will be a difficult and painful process within ICAITI because the problems are very deep-rooted. Present "incentive structures" (if they could be called that) suffer serious defects for an institution that seeks to deliver high quality technical services and be responsive in a dynamic market environment. Amongst the shortcomings in existing policies are the following:

(1) Salaries appear low by industry standards leading to widespread moonlighting even by senior managers.

(2) There are inadequate incentives for additional work or achievement.

(3) Stability of employment has been used as a compensation. For example, policies regarding severance pay are generous relative to other regional institutions.

(4) The incentive policy does not adequately differentiate between permanent staff, contract staff and consultants.

(5) There are no clear norms and procedures for dealing with incentive and compensation issues.

These defects are common to public sector and civil service institutions in Latin America and explain a large part of the relative lack of effective market responsiveness of parastatal and national research institutes.

These personnel and incentive policies need to be reviewed. Additional personnel and incentive issues arise in the subsequent discussion of headquarters versus delegation issues. On a positive note, it is the evaluation team's understanding that a personnel study is being undertaken by ICAITI, but it is unclear whether this study will address all the issues raised herein.

A related issue that resulted from an inadequate personnel policy was the decision to include PEEIR (and FWAE) project personnel within the permanent ICAITI payroll and incentive structure. While ICAITI accomplished immediate objectives of calming dangerous interpersonal and inter-divisional disputes regarding the differing pay and benefits being received by contractors, a better solution would have been the establishment of clear incentive policies, salary norms and personnel procedures as mentioned above. The evaluation team feels that the decision to include project personnel within the permanent ICAITI payroll structure, based on the recommendation of a previous evaluation, was not the best alternative in the long-term. In contrast to the previous evaluation, the present team believes that incentive structures must be diverse to reflect the diversification of functions that ICAITI has begun and will have to emphasize in the future.

The factors that motivate and are necessary to retain a good technical person in applied scientific research are distinct from those for a good technical person engaged in process audits of industry. The incentives for the people who open up the new industrial opportunities are more distinct yet. ICAITI administration has apparently been unwilling to accept these facts and has insisted upon a single, common policy (or lack of policy) for the whole institute. This attitude needs to change if real incentives are to be established to reach a better market orientation, be more productive, recover costs and retain best personnel.

3.1.5 Institutional Overhead

Use of multiple employee and consultant categories and perhaps other external talent on a significant scale raises serious issues regarding Overhead to be charged on such talent. Current policy appears to discourage use of external talent. It is unclear precisely how USAID's practice affects current policy.

The overhead schedule should be structured to allow recovery of the necessary indirect costs, requiring overhead loadings to be applied to all categories of labor. These overhead charges must be sufficiently generous to make it interesting institutionally for ICAITI to actively organize and use other than permanent staff, and to structure itself to make greater use of external specialized talent (a task for which it is in principle eminently suited). At the same time the overhead should take into account relative costs, inflation of project costs, and development objectives.

Overhead schedule(s) should vary according to the costs of organizing and employing personnel from different categories. For administrative ease the number of different categories should be kept to a minimum. But the differential costs of the following should be considered:

(i) consultants from non regional foreign institutions;

(ii) independent non regional foreign consultants;

(iii) consultants from regional institutions;

(iv) independent regional consultants;

(v) permanent staff;

(vi) short to intermediate term contract staff; and

(vii) long term contract staff.

Overall policy on overhead charged requires changes beyond those dealing with treatment of outside consultants. The current practice is to charge 30% on everything. This practice is administratively simple and attractive, but poses the following problems:

- the actual overhead costs (as determined by a cost analysis) of the different components in a budget are distinct;

- the level charged is, on average, too low; and

- different components' overhead have different consequences for strategic planning, which will include determining the mix of permanent and nonpermanent staff use; and the overhead structure must support the differing costs to organize and employ different categories of personnel.

In general, overhead on ICAITI professional personnel time should be much higher, especially in projects of a technical service/consulting nature. They should, in fact, be higher than on outside personnel administered by ICAITI. This is a worldwide practice with enterprises providing such services. On the other hand, overheads on other inputs appear too high.

3.2 The Management and Integration of Delegations and Headquarters

Throughout the course of the evaluation it became apparent to the evaluation team that there were a number of shortcomings in the structure of the organizational relationship between ICAITI headquarters and the delegations. These shortcomings area function of the formal organizational hierarchy of ICAITI, the lack of distinct market orientation, and the process of communication between headquarters and the Delegation. Overall it is the evaluation team's finding that the delegations are not adequately integrated into ICAITI operations and management. Moreover, if ICAITI is to truly function as a regional institution meeting needs of the industrial sectors in the different countries, the delegations must play a key role in both setting the agenda and execution of activities. Such a role requires a greater integration of the delegations into all ICAITI activities, an integration based on both in-depth knowledge of the activities of the different technical divisions and participation in the setting of agendas for different technical divisions and participation in the planning process for the institute as a whole.

One striking point observed by this evaluation team is the gulf between the delegates' (as a class) perception of the relationship with headquarters and the perception of headquarters' management of the same relationship. It almost seems that one is hearing about two different institutions. From headquarters, the delegations are seen to have enjoyed considerable flexibility and liberty to make key decisions in each country. In fact, it is only since 1986 that there have been attempts at greater control in order to increase cost recovery. Their training opportunities are seen to be as great as at headquarters. They receive higher salaries and more fringe benefits. Many of the delegations pretensions to provide services more cheaply are factually wrong. They have had ample opportunity to influence policy in joint meetings but do not take advantage of it. This last point PTO did not correlate very well with the experience of the evaluation team.

The view from the delegations is almost the opposite. Distorted exchange rates (including some unique to ICAITI) exaggerate delegate salaries as well as decentralized servicing costs. Decentralized service deliver can be cheaper and more acceptable in other ways to the market. Their effective voice in policy is minimal - the term "we are a letterbox" was used. They are subject to very tight financial control with derisory discretionary fund or petty cash and are overwhelmingly at the receiving end for central service requests. They serve the center. Under pressure they admit that they have considerable de facto freedom to initiate specific endeavors whenever they can get out from under the workload. That rather contradicts the "letterbox" story.

The fact that such a degree of polarization exists is both significant in itself and undesirable. It goes beyond the old problem of the "blind men describing an elephant". Not only is it symptomatic of the existing lack of integration, it can achieve greater integration.

The subject of delegation roles and integration should be a key theme in the more detailed management audit proposed in this report. It certainly represents one of the most far-reaching management issues facing the Institute. In the paragraphs which follow this team outline some findings and suggestions relevant to the issue. The objective is not to evaluate whose complaints are right or wrong but to outline elements of a more desirable state adequate to the market challenges that the team sees facing the Institute.

3.2.1 Organization and Operations

Currently the delegations nominally report to the Administrative Director and are subject to tight administrative controls. The delegations are a key part of the business development process. Hence, the delegates should either report to the Directory involved with business development - not the Director for Administration - or to the Institute Director. All routine communication would be with the Business Development Directory (whose creation is recommended as indicated earlier). The issue of to whom the delegates should report is conditioned in part by the status they are judged to have. It is arguable that delegates should gave the equivalent status of Division Heads. Whatever the scheme chosen there must be an effective mechanism for coordinating delegate center relations that does not weigh excessively on the Director.

It is essential that the delegations have significant control and discretion over their resources and an impact on broader decisions made at headquarters regarding both project and other resource allocations. As a first step in this direction, some comparison of inputs (staff of delegations and support from headquarters as well as other resources) broken down and compared in a fashion to allow comparison (between headquarters and delegations) should be provided to all delegations so that they might adequately understand their position and that of their colleagues in the context of overall project(s) and other activities.

As discussed elsewhere in this report, ICAITI must make several changes, including becoming more market oriented. The delegations role will be critical to making such changes, therefore, their responsibility and authority must be upgraded. The delegations will have to serve multiple functional roles (both technical and marketing/business development and administrative). Such mixed roles can be managed with a matrix organization structure (see discussion in section 3.1.3 above).

In the near term more explicit provision of resources (to the delegates) for routine logistic and general marketing work should be made. At present these are arbitrarily shuffled from specific project allocations, leading to inevitable conflicts. In addition there appears to be a shortage of logistic support capability within delegations leading to poor use of professional time. As the responsibility and authority of the delegations must increase, this may best be complemented by some increase in delegation staff size and capability. There is a clear need for training of delegates and their staff to prepare them better for the multiple functions of the delegations. This includes in the first place training in areas such as administration, management and accounting. It is important not to let this development take the form of independent vertical "fiefdoms", to the detriment to overall institutional objectives. A reasonable degree of autonomy and significant responsibility and authority are the desired changes for the delegations. These do not require independent fiefdoms but may require some more delegation staff. The latter may simply represent some dispersal of headquarters staff.

The potential for expanding service capability at the delegate and country level should be encouraged rather than discouraged. Overall market trends (as already emerging in El Salvador) may require this. The relative shift of manpower into each individual country may also help resolve the long standing problem of overcoming the resistance of other nationals to move to Guatemala.

At present such a policy could in fact increase rather than decrease the costs of service delivery in certain important candidate cases, as already discussed in the case of PEEIR. This is due to factors such as the relative devaluation of Guatemalan currency (see discussion below) and the possible need to start with lower productivity of less experienced technicians. These factors may be transitory, however, it would be a serious mistake for a regional development institution to base a long-term strategy around a static conception of comparative advantage in an essentially dynamic environment. It is quite possible as well that somewhat higher costs in this context may not unduly complicate cost recovery, especially in countries where prices for ICAITI services are already relatively high. The fact that certain national capabilities are being strengthened may be an appreciable factor not only to governments and beneficiary groups but provide greater momentum to marketing efforts. Near term cost minimization is clearly an important objective for ICAITI, but it cannot be the only criterion. A judicious balance should be sought in developing an overall business strategy.

3.2.2 Incentives and Compensation

As discussed earlier, the incentive policies of ICAITI in general appear to warrant serious review. In the particle case of the delegations, the issue is complicated by the diverse exchange rate policies practiced in the various countries. Official exchange rates neither adequately reflect the differential cost of living, nor its evolution. Various special rates applied by ICAITI don't seem to remove these distortions, and may even exacerbate them. An additional complication factor is the differences in private sector professional compensation between countries. In such an environment it cannot be expected that increases in salary will be the same in all places, or even at the same time. This will require a climate of good communication and probably the establishment of some acceptable indices. It would be useful if improving indices common to other regional institutions (including private sector evaluations) could be developed. ROCAP could be instrumental in this.

The evaluation team, based on very limited data, has noted a scheduling and work load that seems to more frequently demand overtime work from the delegation (in comparison to headquarters staff). The compensatory time payment structure may not be adequate for such situations. The compensatory time and other incentive policies must reflect the fact that a responsible professional may feel constrained not to take much of the compensatory time due if the work requirements are not adjusted.

Other incentive issues are related to institutional changes that must occur. In the future, it likely will be appropriate to offer special incentives to delegations staff (or for that matter headquarters staff) for marketing efforts. An appropriate incentive policy must be developed, perhaps as incentives for achievement above some norm or such. This policy development will require, amongst other matters, answers to such questions as what should be the relative and absolute differential incentives for:

(i) Carrying out special efforts (above the normal project load) such as the work of the Costa Rica delegation on the current OLADE financed auditing activities being done jointly with local private company - SOL 2000); a separate issue is whether this work is in fact being done on time charged to the USAID projects.

(ii) What does a delegation staff get (other than self satisfaction and some accolades) for:

a. Being more productive in use of project/institute resources? What delegation is more productive (see mention in Section 3.2.1 of need for comparative information to be available)?

185

b. Selling more of headquarters services, either general or other special projects such as Project SUSTAIN?

c. Taking on extras such as the OLADE Project?

Many of the required compensation/incentive policy changes must await an overall review of personnel and salary structure, but if there has in fact been differing treatment of headquarters versus delegation staffs regarding recent adjustments, some compensatory adjustment should be implemented immediately.

3.2.3 Coordination and Feedback

Perhaps the most glaring weakness in the current delegation headquarters management and operations procedure is the lack of continuous and in-depth coordination and feedback. Visits by senior management to the delegations and country private sector and government officials to "explain and promote" ICAITI are essentially nonexistent. There is clearly too little time and effort made at keeping the delegations informed in detail of non-PEEIR and FWAE project activities at ICAITI. There appears to be too infrequent opportunity for delegates to exchange ideas and approaches both among themselves as well as with headquarters personnel (in particular those engaged in non project activities). Delegations frequently work overtime just to respond to headquarters demands for information and/or to meet project output targets and reports. The delegations must be shown the results of their inputs on a regular basis, if their inputs are expected to be maintained. Unfortunately communication with headquarters is often a one way street. Lack of feedback, poor access to reports and such are indicative of the operating style by headquarters. This operating style reinforces the perception of the delegations (and shared by the evaluation team) of a headquarters/donor (ICAITI - Guatemala City and ROCAP) driven institutional agenda with too few inputs from the delegations, where delegation suggestions are, if not ignored, certainly not given high priority. What is disturbing is the degree to which a number of the delegation staff have identified (and articulated) many of the same problems noted by the evaluation team (lack of resources for PEEIR and FWAE activity follow up, problems of incorrect measures of project output, need for support for broader marketing, need to better know other activities at headquarters etc.). In spite of this identification of problems, there remains an apparent lack of opportunity for the Delegations to be heard (or if heard, the lack of response and change by ICAITI headquarters and ROCAP).

The critical role the delegations must play if ICAITI is to make the all important transition to a market oriented institution argues for immediate attention to the changes outlined in this subsection.

IV. FUTURE STRATEGIES FOR ICAITI

Earlier in this part of the evaluation report, the necessity for ICAITI to become more market oriented and to better understand both the needs of the region and how its comparative advantage(s) might best be matched to these needs were stressed. It was pointed out that this shift in institutional attitudes and understanding of the market environment will take some significant change and some special studies to facility that change. Without prejudging the results of such necessary strategic planning and market studies, the evaluation team thought that based on its work during this evaluation, its prior experience in the region and with similar problems elsewhere, it was possible to outline some activities that logically would fit a medium term strategy for ICAITI. In addition, further comments are made on what needs to be done to better define the priorities in a future strategy.

At the risk of redundancy, the needs for a fresh strategy are emphasized. The characteristics of ICAITI as a public sector technical and regional institution are rather common in Central and Latin America. As a rule, these institutions do not enjoy an image of effective contribution to development. They tend to be perceived as inward looking (towards disparate interests of existing professional corps) rather than looking out at development problems to be addressed. It will be crucial to management to change not only the reality, but also this image.

It is worthwhile to note in this context that ICAITI has not grown over fifteen years in terms of expenditures (Table IV-4.1). The best three-year period was 1972-74. It is reasonable for an institution with ICAITI's mandate to seek to grow substantially, especially when its annual income usually does not exceed two million (1986) us dollars. This growth should not depend primarily on a few "large" projects (by ICAITI standards) but represent as well a growing strength of a range of ICAITI capabilities over an increasing range of users. This implies the vigorous market orientation advocated by this team and is also the principle consequence of this orientation. If no income growth continues over the next years the kinds of changes necessary to make ICAITI a more effective institution, contributing to Central America's development and recovery, will be more difficult to implement and doubtful in outcome.

It is possible to outline some future activities that are likely to be responsive to the needed change. This outline can be done in the context of the five broad areas of activity of ICAITI:

- Research and development;

- Feasibility and commercialization of new products;

- Technical services to improve productivity and quality control;

- Training in all the above areas; and

- Information services.

In the following paragraphs these areas are discussed in terms of the broader midterm objectives of a new strategy that is more responsive to the needs of the region.

TABLE IV-4.1
EVOLUTION OF ICAITI EXPENDITURES

YEAR	Constant 1972 US$ (thousands)
1972	843.4
1973	1,051.1
1974	1,068.7
1975	809.5
1976	552.2
1977	607.5
1978	672.9
1979	828.5
1980	852.2
1981	1,099.5
1982	618.7
1983	790.5
1984	921.2
1985	1,064.8
1986	932.9

Notes:
1. Inflation rate and factor (except 1985-86) are based on Quetzales Fuente: INE (Guatemalan National Inst. of Statistics)
2. One Quetzal = One US Dollar until Dec. 1984.
3. 1985-86: dollar value increased due to devaluation; factor estimated by KK: 1985 INE factor for Quetzal = .22 x avg. x-change rate of dollar (2.71) = 0.60 less 6% real inflation of dollar = .56
   1986 INE factor(.17)*(2.82) x-chge = 0.48 - 6% US$ inflation =.45
4. General Budget Expenditures of ICAITI figures provided by M. Santos, ICAITI

Source: Internal ICAITI analysis.

4.1 Research and Development

This activity has high prestige within ICAITI, and the R&D mind-set has permeated activities outside of the Applied Research Division. While it was not possible to evaluate this division's activity in any depth, it is notable that there has been very limited commercialization of R&D products in recent years. This raises the question as to whether there exist overall organizing goals that can lead to results feeding into "downstream" activities and leading to commercialization. Another characteristic is the weak connection with training/education.

A macro look at the industrial-technological situation in Central America suggests that R&D as normally understood is rather low priority in general. This in no way is meant to imply that applied science should be extinguished or cut back at ICAITI, especially if, as appears to be the case, that work is largely capable of supporting itself financially. It may, however, imply a change in the conceptual/management context in which it is carried out. A technical institute such as ICAITI should serve principally as a gatekeeper to world (and regional) technology. R&D activity should help serve this function. No more than a small part of downstream services should be directly dependent on internally generated R&D products though it may benefit from associated know-how. Technologies developed elsewhere and having application in similar market environments (industrialized or developing) could be analyzed and selected for introduction into Central America with adaptation to specific candidate application situations.

There is an intermediate level of R&D which is very closely linked to the kinds of services in 4.2 and 4.3 below. It involves research on very specific industrial problems (e.g. how do you freeze a new type of food product). This sort of work is already done at ICAITI, and can provide a useful bridge between R&D and Technical Service capacities.

The bulk of applied R&D at ICAITI is on biological materials of the region. At this broad level there is a correspondence with probable areas of major demand for ICAITI services which should have a high

agro- and forest industry component (see below). An important characteristic of this R&D is that a good part is more oriented towards the agricultural rather than the industrial sectors (e.g. research on coffee rust or rhizobia). Whether this orientation is appropriate should be examined. If found appropriate, answers to the questions of what are the downstream consequences and linkages should be provided.

4.2 Feasibility and Commercialization of New Products

The introduction of new products can be oriented principally towards either the internal or external market. Unquestionably the major thrust today in the general economic planning level in Central America is the external market. It is recommended that the identification of technical areas of action take into close account industrial interest, policy and government programs of technical and financial assistance.

Export sectors being identified include:

- new fresh agricultural products;
- beverages;
- new processed agricultural food products;
- new processed agricultural non-food products (including traditional products with new types of packaging);
- forest products;
- maquila;
- textiles;
- garments;
- medical supplies;
- pharmaceuticals; and
- handicraft.

In the course of this evaluation effort, the agro- and forestry-industry sector was repeatedly highlighted in interviews as being of critical importance for new product development. Fortunately ICAITI has an extensive base of experience in these areas from which to build.

Within the internal market new product development will require many of same activities demanded by the export market (feasibility

studies, etc.). At medium-large industrial level there is likely to be little stimulus from government programs (there may well be differences within the region, with government support available in some of the countries). Effort should therefore seek especially to approach full cost recovery for these activities.

There may be an important variation for programs oriented towards the small and micro-enterprise. In the internal market there may be significant government funding (e.g. El Salvador micro-enterprise project) and perhaps a need for a wider menu of new product technology areas other than those for larger industry. FWAE follow-on activities are an example (see part 2). It will be important for ICAITI to understand to what extent one should expect new products at this level (with "new" also implying products being produced at this level of enterprise for the first time).

Although new product development may at times require various degrees of R&D, it should be seen as much as a field oriented commercialization engineering exercise than as the extension of an R&D activity.

4.3 Technical Services to Improve Productivity and Quality

A first step in the expansion of the scope of services to be delivered is to have the capability to deliver the services and to know there is a market for the services. The need for market assessment has been mentioned a number of times. But it is also important to point out that in expanding the technical services it offers, ICAITI must analyze its current capability and logical extensions of that capability. Extensions of capability may mean in some cases small investment (in new equipment, new staff, staff training etc.); other new services may require considerable investments. The balance between investment possibilities must be considered, with part of the balancing including reliance on consultants, contract personnel and outside capabilities (e.g. equipment), if such reliance proves to be reasonable strategy for particular services.

There is strong logic arguing for extension of service areas, and it is safe to assume that this extension will include at least some service areas related to productivity and quality improvement. Rigorously speaking, there will be functional overlaps between this expansion and the previous items discussed above (in Section 4.2). A practical division is that services go to existing industries, with a focus essentially on their existing product line, and the near term evolution possible from process change. It should be observed that many if not most "new non-traditional exports" in the next few years will not be entirely new, but will be products already produced, but to new specifications, in larger amounts, with lower costs, etc.

Strong development of this service represents an ICAITI priority reflected in the proposal made to ROCAP. As presently defined, the objectives of this proposed project are extremely broad. It is necessary for priorities to be developed with a clearer definition of key areas. ICAITI can't do everything. As discussed earlier, it must assess the market, set priorities and develop capabilities where worthwhile.

The ICAITI part of the PEEIR project is in large part a program fitting in this item, concentrating on one factor input: energy. As observed in the PEEIR evaluation presented earlier in this report, the PEEIR program has shown potential as a means to identify opportunities for a diverse range of technical services, and subsequent marketing of them. This potential has not yet been adequately realized due to lack of follow-up and of technical services.

Adaptation of an extended PEEIR project should seek to form a bridge to a broader systematic technical services program -including marketing and follow-up strategies and development of additional capabilities. This view does not violate the basic goals of PEEIR. For example, the deeper "process audit" represents an accepted approach towards energy auditing, and is virtually a necessity when larger savings involving investment are contemplated. However, there may be important implications for design of the extension, including market strategies towards sectors and individual industries characterized by relatively small energy consumption (but are important in other ways).

Elements of the FWAE project are directly parallel to PEEIR. Primary differences are in the size profile of the firms served (generally micro), the fact they belong to the "informal sector," and the nature of the counterpart organization. There is a comparable opportunity and logic to the future development of this activity, although the marketing strategy will be generally distinct.

4.4 Training Services

This area deserves much more systematic attention and probably higher priority. Field interviews undertaken during this evaluation have shown a clear shortage of many kinds of skilled labor in Central America, especially in Honduras and El Salvador. The skill shortages and gaps reduce the benefits of one of the region's key advantages - relatively low cost labor. Although institutions and programs exist for vocational training and professional retreading, they appear inadequate.

There could be a highly useful role for ICAITI in the strengthening of this training system. It should be observed that ICAITI has considerable experience in training of this type, and on the whole

appears to have been rather good at it. In general, the evaluation team envisions ICAITI as a "second-line institution," less involved in direct training than in the "training of the trainers" and the development of course materials and practices in close collaboration with "front-line" disseminators. This effort will require a high degree of coordination and collaboration with other institutions in the region, much more such collaboration and coordination than is normal practice at ICAITI. However, it should be noted that there are numerous positive examples of such collaboration and cooperation in the FWAE project experience. Such experience should be multiplied.

It should not be necessary for ICAITI to have its own in-house special expertise in all areas where it participates in training development. This expertise can be contracted. Once underway,the know-how in vocational training development is much more important than specific technical knowledge in choosing an institutional role.

4.5 Information Services

The surveys done for this evaluation indicate a demand for ICAITI information services that has not yet been tapped. On-line modem links for computerized information searches or computerized bibliographic searches may be an interesting way to go, supplementing manual searches. A subscription or retainer fee might be tried for some classes of service (with additional fees beyond a certain level of use). San Pedro Sula an industrial pole far from Honduras' capital, was a place where an especially acute sense of lack of information access was expressed.

Information services involve economies of scale fully consistent with a regional role. Every effort should be made to maintain contact with advances in this dynamic area through links with information banks abroad (some of which ICAITI already accesses).

4.6 Coordination and Collaboration with Other Institutions

The comments immediately above regarding coordination and collaboration in the area of training services can easily be extended to all activity areas. In developing programs ICAITI should seek to work much more in a collaborative mode with other institutions in the public and private sectors (international and Central American), including user groups and development institutions with complementary skills (e.g. in training or management as well as specific technological areas). It is not easy, but is very often important to achieve practical results. This collaboration will require clearer definition of ICAITI's priorities and relative limits.

4.7 Definition of Key Areas for Technical Services

Priorities should be a weighted function of the importance of the problem/opportunity, measured primarily by size of the market, and ICAITI's absolute and relative (to local institutions) comparative advantage to deal with the problem(s). The surveys undertaken as part of this evaluation revealed the following priority areas: quality control, technical information, packaging, analytical methods, training, production cost control (including time and motion studies) and waste management.

In considering priority areas for ICAITI activity, there are two dimensions to be considered. First there are functional areas such as those identified in the surveys and these and others shown in the illustrative list presented in Table IV-4.2. Second, there are industrial sectors divided not only by type of product or service but, sometimes at least, other firm characteristics (e.g. size).

It is probable that the range of services provided would vary widely from one industrial sector to another. To do a good process audit, for example, requires greater depth and breadth of experience in a given industry than to do a limited energy audit or quality control sample analysis.

The market analysis proposed above should result in the definition of capability goals that can be described in a sector/function matrix. The goals might be described for the nearer (1-2 years) and longer term (3-5 years).

4.8 PEEIR Extension - Transitional Issues

These issues are discussed in Part 3 of this report. The project is growing in effectiveness and outreach capability. There is much evidence that the industrial sector of Central America is in a recovery phase. Firms interviewed by the evaluation team reported planning or undertaking major process modifications. A number of them expressed the need for outside technical assistance. The most recent exposition of PEEIR objectives shows considerable awareness of these potentials and suggests that steps are being taken to prepare for them. Thus market prospects are bright for PEEIR as well as a broad range of technical services which ICAITI might potentially provide.

4.9 Continuation of FWAE-related Activities - Transitional Issues

Transition issues are particularly acute for FWAE-related activities, due to the effective termination of the Project on December 31, 1987. A chapter is dedicated to them in Part 2. There has been little planning for the transition, so capabilities may be lost in a disorganized climate of crisis. Demand potentially exists for services and projects building from extension capabilities for the small

TABLE IV-4.2
ILLUSTRATIVE MENU OF POSSIBLE FUNCTIONAL AREAS
FOR TECHNICAL SERVICES

Sample analysis, technical assistance on analysis and quality control tests

Technical standards and norms

Quality control diagnostics technical assistance on quality assurance program development

Energy audit (different levels)

Engineering services on energy modifications (audit implementation)

Technical assistance on energy management systems (internal conservation committees, monitoring procedures. etc.)

Preventive maintenance diagnostic, TA on program development

Process audit (general diagnostic), basic parameters for process change (helps identify key problem from energy, materials handling, quality control, process control to packaging)

Technical assistance regarding overall production (including waste management) cost control (extension of the process audit) including materials choice and sourcing, process selection and use as well as activities implicit in process audit

Technical assistance and engineering services on specific process changes/expansion, feasibility analysis

Technical assistance on packaging

Technical assistance physical control systems

business/informal sector, and rural and urban cookstoves. In the small business sector, the transition roughly parallels that proposed for PEEIR: from an energy to a broader focus (though with greater reliance on public sector funding).

4.10 Capitalizing on Possible Donor Project Opportunities

The situation in Central America today and for the foreseeable future, is one of partial saturation of donor-agency project-absorption capability in terms of management and execution. In many of the countries and for problems in many but not all of the sectors, there is a plethora of donor assistance available. The problem is a scarcity of well defined projects and competent and not overcommitted project execution capability. This situation represents a near term opportunity and challenge for ICAITI. In principle, ICAITI represents a relatively consolidated institution, with capacity to be the nucleus managing and executing diverse projects or sub-projects. In some cases it can also function as backup for other institutions. It is important that ICAITI not be forced to attempt to capitalize on this opportunity by chasing any and all types of projects just because of the looming budgetary crisis. On the other hand, it is also important that it take advantage of this opportunity by seeking projects that meet an appropriate near term strategy as outlined above (and as hopefully will be detailed in subsequent studies).

Unfortunately, prime limiting factors in ICAITI's capacity to capitalize on this opportunity are its lack of business development capacity and the lack of internal development of project management capability. Regarding the former, ICAITI has no group to identify the specific opportunities. They efficiently and responsively prepare proposals for potential donor financing and negotiation. Proposals are handled by individuals or ad hoc groups coordinated directly from the Acting Directors office. Conditions would improve with the appropriate staffing of a new Business Development Division as recommended above. Regarding project management capability, only two people have received training in this area, and their training was restricted to PEEIR. Strengthening of project management capability including formal training is an urgent priority.

196

V. SUMMARY OF RECOMMENDATIONS

On Governance (Section 1.2)

- The Board of Governor should convene as soon as possible, and participate in ICAITI's governance;

- The representative from member countries should be changed to the Minister of Industry (or his equivalent); and

- A high level advisory board, including key elements of the business community and conterpart organizations, should meet and advise ICAITI.

On A Transition Period for ICAITI (Section 1.3)

- To clarify, improve, complete, and approve an organized set of administrative procedures;

- To introduce basic changes in the policy process;

- To establish strategic goals and define operational objectives;

- To introduce interrelated administrative, structural, and human resource changes; and

- To develop technical capabiities to match ICAIR4TI's objectives.

Elements of the Transition Period

- Development of a strategic plan (Section 1.4); and

- Analysis of the market for potential services (Section 1.5).

Market Orientation

- Establish more of a market orientation (Section 2.1); and

- Establish pricing and cost-recovery strategies and clear policies (Section 2.2) inlcuding detailed cost analysis and appropriate overhead structure.

Administration and Management

- Make basic structural changes in organization, after a thorough organizational/management study is done, and a matrix organizational structure is considered (Section 3.1.3),

- Review personnel and incentive policies (Section 3.1.4)

191

- Restructure the overhead schedule (Section 3.1.5)
- Fully integrate the Delegations into ICAITI operations plus management (Section 3.2)

Future Strategies for ICAITI (see all of Section IV)

- Research and development (4.1);
- Feasibility and commercialization of new products (4.2);
- Technical services to improve productivity and quality (4.3);
- Training services (4.4);
- Information services (4.5);
- Coordination and collaboration with other istitutions (4.6);
- Definition of key areas for technical services (4.7);
- Transitional issues for PEEIR extension (4.8);
- Transitional issues for FWAE-related activities (4.9); and
- Capitalizing on possible donor project opportunities (4.10).

PART 5
SOME INTEGRATING OPTIONS

PART 5
SOME INTEGRATING OPTIONS

I. INTRODUCTION

This chapter outlines some options for action on the part of ROCAP, with respect to support for ICAITI. Selection of the alternative options was influenced by the information provided to the team by ROCAP. This information indicated that:

i. continuing support for ICAITI was a strong possibility, but was not guaranteed;

ii. there would be no continuing funding for FWAE, but that the strongest possibility for near term continuing support would be for a continuation of the PEEIR project (since the original project authorization had not been expended);

iii. other funding mechanisms, including new project support and other broader type support, are under consideration; but that a possible project focus on productivity improvements, while having received support from ROCAP, was not supported by USAID Washington, and that budgetary constraints very much influenced this support question;

iv. the question of what type of support (project versus broader program support) was an issue under consideration by ROCAP with regard to its support of regional institutions in general, not just ICAITI.

The following paragraphs present a set of discrete options that fall within the realm of feasible support possibilities as outlined immediately above. The earlier parts of this evaluation report discussed a number of changes that need to be made both in the particulars of the projects and in ICAITI in general. For each option, the potential for the achievement of the needed changes is discussed and the evaluation team's recommendation concerning that option is presented. The options considered are:

- Option Zero, no extension of the PEEIR. Hence it would end at the current Project Action Completion Date (PACD) of December 31, 1987.

- Option A, extension of the PEEIR for two years, with modification of the project scope to facilitate some of the recommended changes.

- Option A*, simple extension of the PEEIR for two years, with no modification of the project scope.

- Option B, Option A complemented by more resources (time and monies, core and/or other project support), in order to maximize the achievement of the changes recommended.

II. OPTION ZERO

2.1 Option Description

This option would essentially be an abandonment of ICAITI by ROCAP. Such action, or anything near it in implied budgetary support, would pose a major problem for ICAITI which would face a sudden lack of budgetary support while still having commitments with clients and personnel that come from this very project. Although there is a possibility that an ad hoc collection of new project monies, including possible bilateral USAID financing, may fill part of the budgetary gap, disruption and even crisis may still ensue. While disruption and budgetary crisis is almost of necessity accompanied by organizational change, it is almost of necessity accompanied by organizational change, it is the evaluation team's judgement that this would not trigger the planned and strategically necessary changes. Rather, such disruption and/or budgetary crisis would more likely lead to negative impacts on the institution. The possibility of a looming budgetary crisis is already leading some of the Institute's best people to look into other employment opportunities.

2.2 The Team's Recommendation Concerning Option Zero

This option should not receive any serious consideration. In addition to the possible negative impacts mentioned above, such a decision by ROCAP is viewed by the evaluation team as irresponsible on AID's part. Because of the likely extreme budgetary impact this option would have on ICAITI, it would probably liquidate much of the capital built-up through 20 years of AID investment in this institution.

A disintegration of ICAITI caused by budgetary problems would potentially extract a far higher cost to the region than solely the loss of the organization's capabilities. A loss of funding for ICAITI would inevitably lead to a dispersal of the skills and experience embodied in the organization's staff. Were this dispersal simply directed toward other organizations doing similar work, the problem might be considered relatively minor. It is much more probable, however, that many of ICAITI's current staff would be forced to seek employment in positions unrelated to their present work, and access to the skills they have acquired through work of ICAITI would be lost (to the region) completely.

Also, choice of this option ignores substantial shared AID responsibility for the current situation and associated problems at ICAITI. The current problems, budgetary dependency and other ICAITI institutional characteristics are as much a creation of ROCAP, in its role of principal founder (and non-reformer), as it is ICAITI's. This choice would also ignore the relative success of ICAITI in relation to many comparable projects elsewhere.

III. OPTION A

3.1 Option Description

As outlined above, this option would be an extension of PEEIR for two years. Existing project activities would be continued with a wider focus and some of the needed broader changes would be implemented. The extension would be done with a modification of the project to permit activities not included in the current project description. Existing project components, namely the audits, would be expanded in their focus to allow the examination of process and quality assurance elements. Within the constraints of the degree of project modification possible, the time frame of two years and the available budget, other new components would be introduced. These components would include some special studies and assistance to facilitate at least some of the higher priority reforms and changes discussed earlier in this report (in particular those discussed in Part 4 above). Amongst the higher priority efforts that might be included are strategic planning and market assessment studies and training of personnel in project management. These and other possible elements which would be part of Option A under a modification of the project are listed in Table V-1.1. Based on rough estimates, as of the end of December 1987, there will be some US$ 1.6 million of authorized but unexpended funds available. This amount includes the US$ 900,000 which was part of the original project authorization, but which has not yet been obligated. Finally, there is estimated to be some US$ 180,000 which has accrued from payment funds for audits and other services under the project. If all these funds are included, nearly US$ 1.8 million is available for an extension. This amount can be compared with the recent annual expenditure rate for PEEIR, which is about US$ 650,000. Thus, there are funds for nearly 3 years extension of PEEIR, without changes in the original total fund. As is discussed immediately below, the comparison with existing expenditures is not sufficient because many of the changes and reforms will require outside assistance, some of it from international sources. The budgetary implications of such assistance will be significant.

3.2 Some Issues to be Considered

An extension of the project provides some breathing room for ICAITI. But it does not provide either sufficient time or financial support and other assistance needed for a full transition (as described in the evaluation of ICAITI presented earlier in this report). Nor does merely the provision of more time to utilize already authorized monies provide a strong commitment on AID's part to assist in the transition. Such a limited commitment may fall short of providing the necessary leverage to facilitate even some of the more critical and high priority changes and reorientations.

Option A presupposes some conditions being placed on ICAITI by ROCAP, regarding commitment to institutional change. Many of the changes will not be easy. Major institutional change and reorientation is always difficult and will likely require strong donor assistance and more than project-type financing plus close monitoring of the fulfillment of the conditions placed on the assistance.

The process audit approach to energy auditing is widely recognized as valid. Experience from elsewhere suggests that such audits are fundamental to achievement of greater savings. Some recent PEEIR audits have started to evolve that way. Such audits will provide a natural bridge to a productivity-type project. Moreover, this type of activity can immediately marry with some traditional areas of ICAITI strength.

From our conversations with ROCAP, we understand that considerable flexibility exists to modify the project activities under an extension. It is assumed herein that many of the new components suggested in Table V-1.1 could be included as such modifications.

Option A will require some project redesign and budget analysis. Priorities will have to be set regarding the non-audit type elements. Diagnostic work will be needed on how to carry on policy studies and implementation. The evaluation team does not think that ICAITI staff alone are capable of undertaking most of the necessary studies, but suggests that special teams combine outside experts and ICAITI staff working together on the efforts, rather than simply using outside consultants.

3.3 The Team's Recommendation Concerning Option A

This option should be chosen only if Option B (below) is not possible, or as a step towards Option B. The time and monies and type of commitment from ROCAP under this option is insufficient to accomplish the necessary transition as envisioned by the evaluation team.

IV. OPTION A*

4.1 Option Description

This option is a limited version of Option A. No attempt would be made to deal with the necessary broader reforms that are needed, but the PEEIR would continue to receive financing. This option might be best characterized as the easiest way for ROCAP to delay the more difficult and painful decisions regarding project termination or modification. In the absence of commitment to support the broader reforms needed (Option A or B), Option A* would at least allow the now mature and reasonably well functioning PEEIR project to continue.

TABLE V-1.1
SOME POSSIBLE ELEMENTS OF OPTION A

1. Put full authorized PEEIR money into extension.

2. Allow all funds generated to be used by ICAITI as internal planning sees fit or within broad guidelines. (e.g. use predominantly in country of origin.)

3. Allocate some resources for assistance in undertaking special studies (e.g. strategic plan, market assessment) and other not strictly project based efforts - such as internal policy and procedures development, reorganization study, etc.)

4. Increase training, emphasizing more project management (for internal ICAITI staff) and allowing process related training in selected industries (for both industry and ICAITI staff). Perform some organizational changes.

5. Expand definition of audit in terms of materials, inputs, process, energy forms and economic sector focus.

6. Provide allowances in the promotion component to allow financing of market development for any follow-on (to the audits) service.

7. Introduce realistic and flexible pricing and cost recovery procedures.

8. Expand the role (authority and responsibility) of delegations.

9. Reduce numerical targets of PEEIR to a minimum, and focus instead on savings/benefits from post audit implementation.

10. Continue SIECA policy work only until December 31 1988, with additional team elements to reach useful conclusions and prepare overall documentation.

11. Conduct selected studies on institutional factors affecting the motivation for further energy savings (and which could be implemented rather quickly).

4.2 Some Issues to be Considered

Without more flexibility and broader support, ICAITI cannot deal with the important changes that need to be accomplished. Such strict project support may, at best, just postpone a larger budgetary crisis, while allowing ICAITI some chance to continue in an ad hoc fashion. The downside of this option is not necessarily as negative as Option Zero, but at the same time there is limited upside advantage.

4.3 The Team's Recommendation Concerning Option A*

This Option is not recommended. Even if there is little chance of future continuing support, any continuation of PEEIR should be done under Option A so as to give some support to the very critical process of reform and change.

V. OPTION B

5.1 Option Description

This option, as introduced above, would include the support envisioned in Option A, with additional resources of increased calendar time and monies. Option B basically seeks to assure the resources to carry-out the necessary transition (as described earlier in the ICAITI evaluation) to a complete and successful conclusion. This option would include support for a full, four year transition period. Included would be both the modified project support type monies and nearly unrestricted monies (or only restricted to the various transition activities) normally associated with broader core institutional or program support. How USAID chooses to label the support is immaterial, but what is important is that the support is enough to fully facilitate the needed changes. In addition to continuing new project type activities, Option B would include support for staff complemented by outside assistance to undertake much of the reorganization, reform and special study efforts. The extra time and money to allow all the necessary efforts cannot be supported by the overhead generated in a period of budgetary tightening (as would be the case under Option A). The details of the possible elements of this option would be many, and would include support for all the studies, reorientation and changes discussed in Parts 3 and 4 above. Thus, Option B would be aimed at achieving all the recommendations covered in this report (see listing in Annex) rather than just a selected priority subset that might be achieved under Option A (i.e., the elements of Option A listed in Table V-1.1).

5.2 Some Issues to be Considered

Beyond adding flexibility and resource dimensions to the PEEIR extension that constitutes Option A, there is the issue of leverage. Support under Option B would provide both the time and new money characteristics that would enable ROCAP with continuing leverage to support improvement and positive change in ICAITI.

The more ideal option would include "core support," freeing staff and other Institute resources to deal with the necessary transition activities, rather than be bound to existing (and extended) narrow project activities. The core support could be labeled as special assistance for restructuring, reform, and reorganization assistance necessary to improve project and overall institutional performance (which is what it in essence should). An attraction of the core finance label is that non-project financing is often perceived as indicative of donor seriousness regarding the importance of reform conditionalities.

It might be possible to meet much of what is needed under Option B with a project alternative, such as a variant of the "Productivity Project" recently proposed by ICAITI to ROCAP. This variant would require including in the new project significant other non-project support for the transition-restructuring activities. In this sense, if the needed support for the transition activities is forthcoming in one form or another, other specific project-type financing by ROCAP need not be excluded. But new, strictly project-type financing, even with extensive flexibility, is not a substitute for what is envisioned under Option B.

Funding and start-up date of Option B could be dependent on PEEIR extension flexibility and a more detailed redesign diagnostic, with Option B being viewed as the next step. This might be necessary because this option, with core-type support included, cannot begin before the end of fiscal year 1988, given USAID's programming steps. However, without some early commitment, even while Option A is underway, some of the leverage may not be as strong.

One possible scenario would be the following. ROCAP grants, say, a one year extension of the PEEIR immediately so that longer term planning for the ammendment and Option B activities can take place in a constructive atmosphere. Since the time remaining until project termination (December 31, 1987) is very short, this first step of the extension must be streamlined, with minimal modifications. In March or April of 1988, the ammendment is signed to include the remaining authorized but unobligated funds, and to extend the modified project for a longer period (as deemed necessary to carry out the institutional transition activities planned and included in the amendment). In October of 1988, either an additional ammendment is signed or a new project is established to include the remainder of the institutional transition activities necessary. Throughout the process, ICAITI must be a primary participant in the planning and budgetary analysis.

Very rough estimates indicated that the necessary funding for Option B could be significantly less than requested for the Productivity Project, especially in 1989. It is unclear whether this lesser call on resources might help approval.

ICAITI's Present Director (Acting) is very interested and open to improving the Institute's management and administration, and to moving the Institute to a more market orientation. Now is an opportune time for ROCAP to tap this interest and motivation by supporting the needed changes.

5.3 Team's Overall Recommendation

Option B is the evaluation team's chosen recommendation to ROCAP. Only this option will largely insure the required transition. It is noted that, given programming constraints, it is easier to start with Option A. But initiation of Option A, without a commitment to move to the additional time and money resources associated with Option B, is not recommended. Such action limits ROCAP leverage and decreases the chance for greater successful use of the flexibility that can be built into a PEEIR extension.

VI. CONCLUSIONS

The following table summarizes the conclusions of this section.

TABLE V-1.2
FINAL SUMMARY CONCLUSIONS
FOR ROCAP'S FUTURE DIRECTIONS ON PEEIR/ICAITI ACTIVITIES

Option	Funding	Degree of Leverage Provided	Benefits to ICAITI	Team's Recommendations
Zero	Already allocated	None	Disaster	Absolutely unacceptable
A	Authorized and unexpended funds	Some	Average, and open future	Minimum acceptable
A*	Same as A	None	Minor, and uncertain future	Below acceptable
B	Some additional (maybe $ 1 million non-project type funding plus any project)	Strong	Major and permanent long-term	Recommended

The evaluation team believes that ICAITI's mandate is as valid, or more valid, today than it was when the Institute was founded. The two ROCAP projects evaluated were successful and have changed people's perceptions about ICAITI in a positive way. ICAITI has an enormous and important role to play in the region; ROCAP assistance in a form such as that recommended in Option B could help ensure the region's needs. The many activities recommended in this report and to be included in Option B would not only help ICAITI become more effective in responding to private sector needs, but should also improve ICAITI's capacity for implementation of future donor projects and activities.

ANNEX 1
TERMS OF REFERENCE

ARTICLE III - SCOPE OF WORK

The Energy Efficiency Project has evolved during its implementation in response to industry needs, market factors, and ICAITI capabilities. In its 1986 Work Plan, ICAITI proposed that the Project be extended until August 1989, arguing that this amount of time is necessay for the Project to attain an acceptable level of self-sufficiency and that changes in implementation strategies are required due to flaws in the "logical framework" and basic assumptions of the original Project. ICAITI estimated that the modified operational strategies and additional time would allow the Project to succeed in meeting its overall objectives within the budget originally programmed by A.I.D. The evaluation team should analyze these arguments and provide specific conclusions and recommendations regarding project timing and the activities programmed in the 1987 Work Plan. A specific recommendation for possible extension of both ICAITI and SIECA portions of the Project will be made within the constraints of currently obligated funding.

More specifically, the evaluation team will examine project design, performance and status in order to reach conclusions regarding the implementation strategies, resources and time necessary to: 1) maximize impacts with respect to project purpose and goal, and 2) establish a self-sustaining mechanism which will ensure continuity of project services after ROCAP financing terminates.

The following issues should be covered in the evaluation and the final report:

1. Evaluate project impact to date. Project documents, a recent independent survey which sampled industries in the field, and other sources will be utilized to estimate impacts in terms of: number of industries benefited with energy savings; amount of benefit quantified in percentage of energy bill saved and US$ value; savings in imported petroleum; on-going conservation programs established in industries; and private sector involvement.

2. Evaluate the cost-effectiveness of the different project components. Whch components are most effective in terms of producing immediate benefits (energy savings)? Which components are most important in order to sustain a continued flow of benefits in the future?

3. Determine whether the assumptions on which the project design was based remain valid. If not, how should the project's logical framework be modified, and what changes in project design, implementation, time-frame and financial resources are recommended?

4. Evaluate project outreach efforts in terms of ability to: generate interest and cooperation in national institutions; generate demand for project services; and provide technical assistance and effectively transfer information. Assess the effectiveness of actual and planned project interactions with other programs at ICAITI, SIECA, USAIDs, related regional and international technical organizations, and other related projects in the region. Assess whether the communication and responsiveness to counterparts and USAIDs has been adequate or requires improvement. Examine ICAITI's organizational structure and how it affects outreach capabilities, making recommendations where appropriate.

5. Evaluate project management and coordination. Assess the appropriateness of the current allocation of human resources to the various project activities in accordance with the project purpose and goal. Review the nature and extent of involvement of non-project ICAITI and SIECA technical and administrative officials. Recommend areas of greater collaboration.

6. Evaluate project staff performance and their ability to work and iteract as an ICAITI team, in terms of their ability to understand project goal and objectives, and to solve collectively perceived and targeted problems. Evaluate the degree of integration and cooperation between the country coordinators and field representatives, and the central team. Examine how incentives affect personnel performance.

7. Evaluate project strategy and progress in identifying key institutions and groups in the various countries and providing them with training and technical assistance.

8. Examine the project's strategy for the development and dissemination of publications and training materials to meet the needs of educators, field personnel and other target groups.

9. Assess ICAITI's strategy to develop sustainable program activities beyond the ROCAP project completion date. Key questions to be analyzed include: Is ICAITI picking up key costs? To what extent is ICAITI obtaining, at an increasing rate, other resources to fund project activities? To what degree has ICAITI defined the nature/level of its program as a permanent ICAITI activity? What project activities have the most potential for cost-recovery and what actions must be taken to realize this potential? Develop a realistic plan for achieving a sustainable flow of project benefits after ROCAP's financial support ends.

10. Determine whether existing reports and control systems adequately describe project activities and provide a basis for proper impact and cost-benefit analysis. Specifically evaluate the progress and appropriateness of the activities underway and programmed in the data-base component.

11. Determine to what extent the recommendations of previous evaluations have been implemented and the factors facilitating or preventing implementation.

12. Assess the effectiveness of ICAITI, SIECA and ROCAP administrative backstopping to the Project as they relate to the procurement of goods and services, financial management, progress reporting, approvals, etc. How could these activities be improved?

13. Evaluate the environmental impact of the energy conservation measures being recommended and implemented under the Project. Recommend changes if necessary.

14. Evaluate the performance of SIECA in terms of its progress towards programmed objectives. Provide recommendations on how SIECA research and resources could be better utilized to increase project impact.

15. Make specific recommendations for improving the likelihood of attaining programmed end-of-project conditions (see project description in section B.2.2. above).

16. Make recommendations for necessary surveys, analyses and documentation for eventual project close-out.

Objectives for the Evaluation of Fuelwood Project

With the Fuelwood Project coming to an end, ICAITI and ROCAP have a joint interest in a final evaluation which would look at the following basic issues (it should be noted that ICAITI, as a part of its project close-out and documentation process, is in the process of organizing data which will facilitate answering a number of the questions posed in this section).

a) How can ICAITI best take advantage of the Project experience to continue providing renewable energy technology services on a self-sustaining basis?

b) What has been the development impact of the Project and how could the impact be improved in future projects? Contractor will review ICAITI Technology Documentation Reports on the Project and verify findings through interviews with certain counterpart organizations in the CA/P region.

Considering these basic issues, and analyzing each technology separately, a number of specific questions should be answered in the evaluation report:

Concerning Sustainability:

1. What external factors (political, macroeconomic, etc.) affect the chances for sustainable benefits? Considering these factors, which services and technologies in which geographic areas have the greatest potential for sustainability?

2. Has sufficient institutional capacity been established (in ICAITI and/or counterpart organization) to enable the benefits to continue in a self-sustaining manner?

3. Which services are addressing a current and continuing need?

4. Which services merit continuation based upon the benefits which they provide and existing demand? Which services are most "marketable" in terms of their potential for cost-recovery, and in what markets (private secotr, PVO's, USAIDs, other intenational organizations, etc.)?

5. What revenues will be needed to sustain these services, and where will they come from?

6. How could the services be provided in a more cost-effective manner?

7. Under what implementation mechanisms would the probability for a sustained stream of benefits be highest (ICAITI, PVOs, National Organizations, Private Sector, others)?

8. Under what conditions would these mechanisms be most effective?

9. What actions could ICAITI and ROCAP take to establish these conditions?

10. How much time is required for the mechanisms to become truly self-sustaining?

11. How do incentives (with respect to institutions, staff and beneficiaries) influence project performance and prospects for sustainability?

12. In conclusion, where possible, for each type of activity and technology which the Project has developed, recommend specific actions for the future (such as: discontinue; continue as planned; or continue with adjustments, specifying the adjustments in terms of how, when, where, why and who should be responsible).

13. How adaptable is ICAITI to incorporating new techniques, technologies or management systems to enhance its outreach capabilities at the firm-level?

Concerning Development Impact:

14. To what extent has the Project succeeded in meeting its purpose: to develop, demonstrate and make available for transfer, efficient, low-cost fuelwood and non-conventional energy technologies?

15. What portion of the target group (12 million Central Americans using wood as fuel) has been reached?

16. what has been the impact on counterpart organizations?

- Number and type of organizations active in each country
- Institutional knowledge gained
- Coverage per country (social and geo-political) and its relationship to demand or potential demand
- Effectiveness of the organizations and their rates of output
- ICAITI interaction and coordination with counterparts and with "competitors" in the field

17. What are the most important benefits which have accrued as a result of the Project? To whom? Provide special consideration impacts on women, the environment, improved housing and welfare in rural areas, and the creation or support of small private enterprise.

18. Will the documentation process underway effectively increase the developmental impact of the Project? How could ICAITI improve its program for project documentation during the final months of the Project?

19. How did project management and the coordination of human resources between the varying project activities (research, demonstration, construction, supervision, administration, coordination with counterparts, promotion, sales, etc.) affect project impact? How could these roles be better organized in future projects?

20. Evaluate plans for promotional documents to be prepared in 1987 in terms of their support of project goal and purpose and their potential to support continuing services in the future.

21. In conclusion, how could ROCAP and ICAITI increase the impact of similar technology development and extension projects in the future? What lessons can be learned from the Fuelwood Project?

C.2. General Evaluation of ICAITI

Conclusions concerning many common questions asked above can provide insight into factors which could help ICAITI to improve impacts, contintuity of services and revenues both in present and future projects. The following questions should guide the evaluation report to useful overall conclusions about ICAITI's role, effeciveness and future.

-What practical measures could be implemented to improve project management, operations, outreach and productivity?

-What actions must ICAITI take to improve cost recovery of its services. Propose policy alternatives for establishing fees for the various services ICAITI provides or will provide under present and planned ROCAP projects?

-What organizational modifications could be implemented to improve ICAITI's ability to identify needs, develop effective services to attend such needs, and market the services on a cost-recovery basis.

-Evaluate present systems for cost projections and control, communication flows, internal monitoring, and field monitoring. What recommendations can be provided to improve these systems?

-How could ICAITI improve its relationship with other technological organizations working in similar fields?

-How can ICAITI better share its experiences under the projects with other entities, thereby assisting the developmental process in other areas?

-Examine recent ICAITI proposals for new projects (Industrial Outreach and Growth, Technology Exchange Board) and determine how the lessons learned from the Fuelwood and Efficiency Projects could be applied to the new project designed.

ANNEX 2

PERSONS CONTACTED DURING EVALUATION

ICAITI

Headquarters

W. Lukwig Ingram, Jr., Acting Director, Deputy Director, Chief, Division of Technical and Industrial Services

Luis F. Vettorazzi T., Management and Financial Officer

Mario Arno Santos, Chief, Division of Control and Budget Costs

Fernando Mazariegos, Chief, Division of Analysis, Tests and Trials

Rocio Marban, Chief, Division of Documentation

Salvador Samayoa, Chief, Division of Tehnical Publications

Joaquin Bayer, Chief, Division of Technical Standards

Rodolfo Espinosa, Project Manager, PEEIR
Luis Chinchilla, PEEIR
Mario Ortiz, PEEIR
Orlando Posadas, PEEIR
Mario Santizo, PEEIR

Oscar Gil, Project Manager, FWAE
Byron Rosales, FWAE
Marco Augusto Recinos, FWAE
Guillermo Perez, FWAE
Arturo Estrada, FWAE
Oscar Maldonado, FWAE
Otto de Leon, FWAE
Carlos Gonzalez, FWAE
Edgar Moran, FWAE

Enrique Hernandez, Division of Analysis, Tests and Trials

Jaime Valladares, Division of Applied Research
Sheryl de Cabrera, Division of Applied Research

Elias Hill, Program Coordinator ROCAP/ICAITI

Delegations

Michele Pagliara Valz	Guatemala
Jaime Gonzalez	Delegate, El Salvador
Carlos Vargas	Assistant
Alejandro Maldonado	Assistant
Eduardo Gonzalez	Assistnat
Angel Porfirio Sanchez	Delegate, Honduras
Jose Asuncion Lopez	Assistant
Francisco Tercero	Assistant
Felix Del Barco	Delegate, Costa Rica
Agustin Rodriguez	Assistant
Luis Fernando Arce	Assistant
Hugo Alvarez Kruger	Delegate, Nicaragua
Celedonio Moncayo	Delegate, Panama

SIECA

Rafael Perez, Director, Department of Physical Integration

Julio Obiols, Project Director, PEEIR
Raul Valdez, PEEIR
Jorge Borstcheff, PEEIR
Carlos Sarti, PEEIR
Irma Esperanza Palma, PEEIR

ROCAP

Nadine Hogan, Director

Bill Schoux, Deputy Director

Elena Brineman, General Development Officer

Carl Duisberg, Regional Energy Advisor

Mike Lofstrom, Project Development Officer

Gustavo Ruiz, Assistant Project Development Officer

Costa Rica

General

Alvaro Umana, Ministro de Industria, Energia y Minas

Gloria Villa, Subdirectora, Direccion Sectorial de Energia

Eduardo Doryan Garron, Viceministro, Programa Nacional de Ciencia y Tecnologia

FWAE

Senora de la Asociacion de Mujeres de San Ignacio de Acosta (SIDA) (beneficiary productive stove and bread oven - 52 women cooperative), San Ignacio de Acosta

JAPDEVA technician, Limon

Cooperative leader/beneficiary; charcoal kiln, Boca del Rio Matina, Limon

Administrator of Pueblo Nuevo refugee camp; bread oven, Limon

Visit to solar herb dryer (owner not available), Negev Guapiles, Limon

Visit to solar/combustion cocoa dryer, Cahuita, Limon

PEEIR

Edgar Villalobos, Compania Numar, S. A., San Jose

Guido Cordero Barquero, Sinteticos, S. A., San Jose

Productos de Concreto, San Jose

R. Salvador Castillo, Direccion de Proyectos; Marcela Shedden H., Conversion Industrias y Distribucion; Franklin Chinchilla Hidalgo, Dept. Fuente Primaria de Energia; Odemar Ramirez, Jefe, Div. Recursos Carboniferos; RECOPE

Lactaria Costarricense

Roger Solano, Jefe Mantenimiento, United Fruit Co., Queipos

El Salvador

General

Peter Deinken, USAID

Ana de Guth, USAID

Leo Garza, USAID

Carlos Palacios, Director, Programa de Promocion de Inversiones y Diversificacion de Exportaciones (PRIDEX)

Jose Luis Avalos, Director Ejecutivo, Programa de Promocion a la Pequena y Microempresa (PROPEMI)

Oswaldo Bueno Netto, Asesor del Presidente, CEL

FWAE

Mauricio Burgos, CENDEPESCA, Ministerio de Agricultura y Ganaderia (MAG)

Napoleon Valiente, Gerente Region Central, Ministerio del Interior

Elena de Velasquez, CARITAS

Beneficiary - bread oven; Valle Nuevo II, Sta. Lucia, Ilopango

David Rogers, DJC-Save the Children

Carlos Roberto Molina, AT Director, Ministerio del Interior

Ray Lynch, USAID

Tim Truitt, USAID

PEEIR

Roberto Ortiz Avalos, Executive Director; Carlos Abarca Gomez, Associacion Salvadorena de Industriales

Jose Dominguez Montoya, Molins y Cia.

Renan Oliva, ROTOFLEX

Orlando Hernandez Fuentes, Corporacion Bonima

Jose Mauricio Lopez, Industrias Unidas

J. Arturo Gavidia, CONELCA

Daniel Valdivieso, La Constancia

Jose Antonio Escalante, CELPAC

Americo Melara, Kimberly Clark de Centroamerica

Carlos Herodier, Embotelladora Tropical

Victor Perez, Industrias Quimicas

Jaime Hernandez, Fabrica Oliva

Jose Alberto Gonzalez, Molins y Cia.

Honduras

General

Rafael Ochoa, Director, Departamento de Infraestructura, SECPLAN

Lynn Sheldon, USAID

Hugo Elvir, USAID

Wesley Bohl, USAID

Val de Beausset, AID Contractor

FWAE

Edgardo Romero, Energy Coordinador, PTR

Enesto Aldarado, national PTR stove technician

Peter Stevens, Peace Corps Director

Carlos Andres Zelaya, FAO Program Assistant in Honduras

Luis Enrique Alvarez, Regional Economist, PTR Choluteca

Franklin Caceres, Mechanical Engineer at PTR/UDA shop, Comayagua

PTR Central Zone techniian

Ramon Espinoza, PTR Manager, Tegucigalpa

Marcial Montecinos and 3 companions, solar salt-black plastic, Gulf of Fonseca (beneficiary)

Guadalupe Correa, ceramic stove course/stove user; Los Chorritos, Sabana Grande (beneficiary)

Caretaker/beneficiary: biogas, solar, dairy..., San Jose Obrero cooperative and training center (beneficiary)

Brick-kiln beneficiary, Siguatepeque (beneficiary)

Sr. Andres, brick-kiln beneficiary, Siguatepeque (beneficiary)

D. Felipa and other members of El Porvenir Coop, beneficiaries-ceramic stove course/stove users; El Porvenir de Siguatepeque (beneficiary)

Benjamin Carias, Departamento de Planificacion, COHDEFOR

PEEIR

Eduardo Aragon, Presidente, Asociacion Nacional de Industrales (ANDI)

Henry Bahr, Presidente, Comite Nacional Asesor del PEEIR

Dorcas Cantarero, Directora Ejecutiva, ANDI

Jorge Millian, Gerente de Mantenimiento, Quimica Dinant (beneficiary)

Joseph Bonthems, Cia. Hulera Sula, San Pedro Sula

Jose Ramon Morales Funez, Planta de Productos Lacteos Sula, San Pedro Sula

Jose M. Borell, Polymer, S. A., San Pedro Sula

Jorge Godoy Padilla, Mejoral, Sterling Products International, Tegucigalpa

Angelo Poletti, HONDULIT, San Pedro Sula

Sady Rivera Pineda, Boquitas Fiesta, San Pedro Sula

Leonel Romero, Productos Continental, San Pedro Sula

Ing. Caraccioli, Pepsi Cola, Embotelladora Sula, San Pedro Sula

Jose Luis Broitman, Textiles Red Point, San Pedro Sula

Carlos Flores, Cerveceria Hondurena, Tegucigalpa