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EVALUATION OF THE RETAIN PROJECT

for

INTERNATIONAL DEVELOPMENT RESEARCH CENTER

BOGACH ASSOCIATES LIMITED
558 Cole Ave
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ACRONYMS

AIM	Asian Institute of Management
CREDMI	Centro Regional de Desarrollo de Microaprovechamientos Hidroelectricos
EEC	European Economic Commission
ERDM	Energy Research Donors Meeting
IDEE	Instituto de Economia Energetica
IDRC	International DEvelopment Research Center
ILO	International Labour Organization
OLADE	Organisacion Latin Americano de Desarrollo Energetico
RETAIN	Rural Energy Technolgy Assessment and Innovation Network
SPRU	Science Policy Research Unit, University of Sussex
UNDTCD	United Nations DEpartment for Technical Cooperation and Development
USAID	United States Agency for International Development

TABLE OF CONTENTS

	SUMMARY AND CONCLUSIONS	i
1.	BACKGROUND TO THE EVALUATION	1
1.1	Introduction	1
1.2	The Project	1
1.3	Evaluation Framework	5
2.	THE RESEARCH TEAMS	6
3.	QUALITY OF RESEARCH OUTPUTS	9
3.1	Final Reports	9
3.1.1	Comments on Individual Country Studies	9
3.1.2	General Comments	12
3.2	Reports by the Network Adviser	14
3.3	Outputs from Meetings	15
4.	IMPACT ON TRAINING AND RESEARCH CAPACITY	16
5.	USEFULNESS OF THE RESEARCH	17
5.1	Policy Makers	17
5.2	Researchers	18
6.	THE EFFECTIVENESS OF THE NETWORK	18
6.1	Team Interactions	18
6.2	Advisers	19
6.3	Meetings and Field Trips	20
6.4	Common Methods and Approaches	21
6.5	Institutional Aspects	22
6.6	Overall Network Effectiveness	22
7.	FOLLOW-UP RESEARCH	23
7.1	Justification	23
7.2	Scope and Focus	23
7.3	Organization/Approach	24
TABLES		
TABLE 1	Summary of RETAIN Country Studies	3
TABLE 2	Planned IDRC Budget--RETAIN and Related Projects	4

ANNEXES

- Annex 1 Consultant's Terms of Reference
- Annex 2 Evaluation Issues and Indicators
- Annex 3 Lists of Documents Consulted, Contact List, Itinerary

SUMMARY AND CONCLUSIONS

Background

RETAIN is IDRC's largest single rural energy project. It supported a network to compare and analyse methods of rural energy technology assessment and innovation. The project funded five teams to carry out studies (from Argentina, China, Costa Rica, the Philippines and India), a network adviser and meetings.

The project ran for a total of forty-six months from June, 1985 to March, 1989. Follow-up studies by two RETAIN teams are still underway. IDRC's planned budget for the main RETAIN project was Cdn \$665 thousand, while associated activities were budgeted at \$245 thousand for a total of \$910 thousand.

The project has generated support from participants, IDRC staff and other donors for a second phase. This evaluation is intended as an input to the planning of further research. Many of the comments in it come directly from project participants.

The evaluation covered the quality of the research outputs; the impact of the project on training/research capacity; the usefulness of the research for policy-makers and researchers; and the effectiveness of the network. In addition, recommendations are made about a possible second phase of the RETAIN project.

Quality of the Research Outputs

The main outputs of the project are the five final reports of the country teams, the synthesis report of the adviser and short versions of the studies prepared for inclusion in a special issue of World Development.

Since the team reports are the basic materials for the other reports, it is their quality that is the main concern. Four of the five studies were competently executed studies that met at least some of the objectives of the RETAIN research. Two of the studies, those from Argentina and India covered most of the RETAIN issues and make an original contribution to the development of research methods in rural energy.

The other three teams were new to the area of rural energy technology diffusion. The studies from China and the Philippines covered only one of the four elements proposed to be included in the RETAIN studies: analysing the experience with technology diffusion. The Costa Rican report is the weakest of the studies. It is a general rural energy report rather than a report on rural energy technology assessment and diffusion.

A detailed evaluation of the country studies indicates that the teams could have benefited from more attention to ensuring

that the research design met RETAIN objectives; a more multi-disciplinary approach; better use of economic analysis to provide an analytical frame for the studies; and more attention to gender and community issues.

The original intention of RETAIN was that the results of the studies could be analysed and compared in a final synthesis report that would cover the four main RETAIN research objectives. However, because several of the reports dealt only with the experience of technology diffusion, this became the main focus of the synthesis.

The synthesis draws from the country studies and the literature a set of basic principles to guide policy makers and researchers in improving the prospects for the diffusion of rural energy technology. Together with the four abridged reports to be included in a special issue of World Development, it will be of value to policy makers and researchers.

However, one of the original intentions of RETAIN was to contribute to the development of more analytical methods for work in the area of rural energy. The Argentinian and Indian studies contain some innovative elements that meet this objective, but they are not drawn out in the synthesis report or in the short versions of the papers. Because rural energy is a new area, the development of research methods is an important objective that should not be set aside.

Impact on Training and Research Capacity.

RETAIN made an important contribution to the development of research capacity in rural energy. Until RETAIN, much of the expertise in this area accumulated in international development agencies, where it was possible to evaluate and assess experience from projects in different countries. There were no opportunities for similar sharing of experience by researchers in developing countries.

RETAIN provided three of the teams with their first intensive exposure to rural energy technology diffusion (China, Costa Rica, and Philippines) and the other two teams with the opportunity to develop their capacity further.

Results from the RETAIN studies are used by the Argentinian team in their well-known course on energy planning, and by the Filipino team in their courses on management of government programs. They also influence the courses of Dr. Bhatia to Indian civil servants.

Some impact of the project on outside participants in the RETAIN meetings is also likely but impossible to judge because of the lack of meeting documentation or opportunity to speak to outside participants.

Usefulness of the Research

The individual research reports are of varying usefulness to policy makers in the different countries. The most useful was the Argentinian study, which has influenced the policy of the local utility to develop micro-hydro as an alternative to grid expansion. Dr. Bhatia's RETAIN research has influenced his energy policy work for the Indian government. The work of the Chinese, Costa Rican and Filipino teams has had less direct policy impact.

The package of the synthesis report and the abridged country reports that has been prepared for World Development will provide useful input to program and project development by policy makers in international development agencies and governments.

The Argentinian and Indian studies contribute to the development of research methods. The Chinese and Filipino studies are rare critical analyses of projects that are often considered simplistically as "successes".

Dissemination of RETAIN results has already occurred through the RETAIN meetings and presentation of the results in other forums. RETAIN results have been presented at several meetings and conferences in Argentina. The Argentinian team has also presented its results at three international meetings, the Indian team at two, and the Filipino team at one. The results of the synthesis report have also been presented at international meetings, including those of the Energy Research Donors.

Planned publication of the synthesis and summary papers in World Development will also disseminate the results to the research community. If this publication is delayed, IDRC should consider publication of the RETAIN summaries in its own manuscript series.

Network Effectiveness

Since 35 per cent of total expenditures were network-related, a key question in the evaluation is whether the network resulted in better results than would have been obtained from individual studies.

Interaction among the teams was not strong. Each team remained primarily interested in its own research effort and there was not much cross-fertilization of ideas. Communication between the advisers and the teams was stronger, but contact was limited mainly to the three meetings and a single visit by the network adviser in the course of the research study.

However, the network generated momentum that contributed to the completion of all five research studies. Three of the teams proposed and are now executing follow-up studies. The synthesis report builds on the results of the individual studies, and the

synthesis and abridged studies are substantial enough to occupy a special issue of World Development.

While all of the networking aspects of RETAIN did not work immediately, building a network is a process. Time is needed to develop relationships, common perceptions and approaches. RETAIN laid the basis for an effective network.

A Second Phase of RETAIN

While there were some weaknesses in individual research efforts and in networking aspects of RETAIN, its achievements were considerable. The project contributed to the development of research capacity, provided a critical analysis of experience with technology diffusion (China, India, Philippines, synthesis report) and contributed to research methods (Argentina, India).

There is an opportunity to build on the results of RETAIN, to take advantage of the increased capacity of the teams and the potential for more effective exchange. At the same time, the research frame and objectives could be adapted to changing perspectives on rural energy work.

The report concludes that there is ample justification for a second phase of RETAIN. The enthusiasm of all participants is a powerful argument for continuation, combined with evidence of substantial achievements. Detailed recommendations follow:

- * Research designs need to incorporate rigorous analytical methods, consideration of socio/cultural and gender issues, and a knowledge of relevant previous research.
- * More women and social scientists need to be brought into RETAIN teams and the advisory team.
- * A formal appraisal process is needed for RETAIN reports.
- * RETAIN meetings need to focus on the research framework and the work of the different teams in relation to it. Proceedings should be prepared after all meetings.
- * Network arrangements need to include a full-time adviser; part-time advisers; and resources for translation, mini-meetings and a newsletter.
- * IDRC contracts with teams should specify their role and participation in the network.
- * RETAIN should be seen as a long-term program that is funded in three-year phases rather than as a project.

1. BACKGROUND TO THE EVALUATION

1.1 Introduction

IDRC has sponsored research on rural energy issues since the early 1970s, through the Science and Technology Program. The largest single project in this area is the Rural Energy Technology Assessment and Innovation Network (RETAIN), a project to support a network to develop a more integrated and systematic framework for analysing rural energy policy issues and technology diffusion.

RETAIN and several associated projects are now either completed or nearing completion. The project has generated sufficient support among the participants, IDRC staff and other donors to justify consideration of a second phase. However, before going ahead with a second phase, IDRC decided to commission an evaluation.

The evaluation is intended to provide IDRC with an assessment of the achievements of the project, the lessons learned and recommendations about a possible second phase of RETAIN. It was undertaken by the consultant between March and June of 1989. During this period, brief visits were made to three of the five RETAIN teams (in Argentina, India and the Philippines) and the network adviser, based at the University of Sussex.

1.2 The Project

Background. In the early 1980s, there was considerable disillusionment in the international community about rural energy projects. There had been many demonstrations and experiments with energy technologies that had made little impact. It was recognized that new approaches were needed to defining energy needs, selecting technologies and developing mechanisms to introduce technologies into the rural environment.

RETAIN grew out of this atmosphere. It was an ambitious project that aimed to support a network of third world researchers to develop a more effective approach to rural energy and technology issues. It was ambitious for two reasons-- first, the work was path breaking; and second, there were not many researchers in third world countries that had wide experience in technology diffusion.

In late 1984, IDRC invited researchers from 10 developing countries to a project identification meeting in Ottawa. This meeting defined the framework for the RETAIN project. Participants identified key issues to be investigated and the process by which the network could be initiated. The project was approved by IDRC in March 1985 and got underway in June 1985.

Objectives. The general objective of RETAIN was to support a network to analyse and compare methods of rural energy technology assessment and innovation in developing countries. The specific objectives were:

- (a) to understand the nature, scale and context of particular end-uses for which energy is required;
- (b) to develop and apply methods by which to compare a range of technological options for particular end-uses;
- (c) to identify and evaluate the constraints to the innovation and diffusion of rural energy technologies;
- (d) to make recommendations to planners and policy makers concerning the selection, development and introduction of rural energy technologies.

Institutional Arrangements/Organization. After the project identification meeting, proposals were made to IDRC by groups that proposed to participate in RETAIN. However, there were a limited number of situations where research capacity was combined with an opportunity to study rural energy technology diffusion.

Proposals were accepted from teams in Argentina, Costa Rica, China, and the Philippines and these groups were contracted by IDRC to conduct studies as part of RETAIN. For administrative reasons, an associated Indian team was supported separately, but considered part of RETAIN. Each team carried out a study of rural energy technology assessment and diffusion, using a framework that was to include end-use analysis, analysis of technological options, and identification of constraints to or requirements for successful diffusion of the technology (see Table 1 for details of national studies.)

The project included a network adviser, funded on a half-time basis, to provide support to the teams, maintain contact with and among the teams, organize meetings, ensure comparability among the country studies, and synthesize the results.

The network was also provided with the resources to hire consultants, hold meetings, and publish reports (See Table 2). It was expected that the network could incorporate other groups over time, with or without these groups receiving support from IDRC.

Budget/ Schedules. The project was originally conceived as a 30-month endeavor with a total IDRC budget of \$528 thousand Cdn. However, in June, 1987, the project was revised to extend the time and increase the budget. The project was extended to run from June, 1985 to April, 1989, a total of 46 months. The IDRC budget was increased to \$665 thousand Cdn (see Table 2.) Separate follow-up contracts were concluded with the Argentinian and

Chinese teams that ran parallel to the extension of the main RETAIN project (see below).

Associated Projects. The above description covered the main RETAIN Project. However, as the project evolved, a number of RETAIN activities were funded separately. These included the funding of Dr Bhatia's participation in the Indian component of RETAIN, as a small part of a much larger IDRC project with the Tata Research Institute in India.

The participation of African researchers in a research and training workshop, that was combined with the second RETAIN meeting (in China/Manila, Nov. 1987), was funded as a training activity (see Section 6.3.)

The Argentinian and Chinese teams were funded separately to conduct follow-up research to their final reports, which were delivered in mid-1987. This ensured that the network could continue functioning until 1989 while the synthesis report was completed and results disseminated.

Of the total planned budget for RETAIN and related activities, approximately 45 per cent was for the country studies, 17 per cent for the network adviser, 18 per cent for meetings, 10 per cent for the training workshop, and the remaining 10 per cent for other expenses (see Table 2.)

Current Status. The main RETAIN project is now virtually complete, as are the Indian component and the China/Manila Workshop. Final reports have not yet been received for the follow-up work from Argentina and China.

Research issues for a second phase of RETAIN were discussed at the final meeting in Argentina in November, 1988. A preliminary research outline was prepared that focusses on institutional arrangements needed for the successful introduction of rural energy technology.

Seven proposals have been received for the second phase. The teams represent Argentina, China, Costa Rica, India, Philippines (original participants), as well as Uganda, Senegal (new participants.) IDRC staff are now preparing a project proposal for RETAIN II.

1.3 Evaluation Framework

Key issues to be evaluated have been identified in the Terms of Reference (see Annex 1.) The consultant developed a framework for evaluation that sets out the indicators that have been used for each issue (see Annex 2.)

TABLE 1
SUMMARY OF RETAIN COUNTRY STUDIES

COUNTRY	INSTITUTION	TEAM COMPOSITION	RESEARCH TOPIC
ARGENTINA	Instituto de Economia Energetica (IDEE) FundacionUniversitaria de Obera (FUA)	4 engineers 1 economist 1 sociologist	Viability of micro-hydro, gasifiers for decentralized power vs grid electricity
CHINA	Institute for Techno- economic and Energy System Analysis	4 engineers	Comparison of the use, viability and cost of micro-hydro and biogas units
COSTA RICA	Centro de Investigacion Sociales, Ambientales y Technologicas	1 engineer/economist	Evaluation of performance, costs and benefits of energy devices for cooking, shaft power, domestic power and crop drying.
INDIA	Institute for Economic Growth	1 economist	To demonstrate a framework for economic analysis of renewable energy technologies through case studies in India for the end-uses of water pumping, street lighting and other rural needs.
PHILIPPINES	Asian Institute of Management	1 MBA 1 MBA/MSc 2 engineers	To identify the factors that would affect the successful diffusion of gasifier technology in the Philippines, especially as a supplement to diesel engines.

TABLE 2

PLANNED IDRC BUDGET--RETAIN AND RELATED PROJECTS
(000 Canadian \$)

MAIN RETAIN PROJECT (REVISED)

Network Adviser	156
Research Teams	
Argentina	97
China	40
Costa Rica	57
Philippines	75
Sub-total	270
IDRC Administered Funds	
Capital	20
Conferences/Meetings	160
Follow-up Work	35
Printing + Reproduction	1
Publications	5
Consultants	3
Contingency	15
Sub-total	239
Total	665

INDIAN COMPONENT	N/A
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TRAINING WORKSHOP/AFRICAN PARTICIPATION IN CHINA/ MANILA MEETING	95
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ARGENTINA FOLLOW-UP	66
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CHINA FOLLOW-UP	84
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The main questions that were asked were the following:

- * What was the quality of the research outputs?
- * What were the project's training related impacts, including development of research capacity and institution building?
- * How useful were the results of the research to policy makers, practitioners and researchers?
- * How effective was the network in creating results that were greater than those from individual research projects?
- * What recommendations can be made about a second phase of RETAIN?

The evaluation is based on: (a) review of project documents available in IDRC's Ottawa office (because of the voluminous project output, the focus has been on final reports); and, (b) interviews with the Argentinian, Indian and Filipino teams as well as the network adviser. A complete list of documents consulted, persons interviewed and itinerary is given in Annex 3.

While the evaluation must be subjective, many of the comments made come directly from participants in the project. It is their assessment of the usefulness of the network and the quality of the outputs that is at the center of the evaluation.

2. THE RESEARCH TEAMS

Before discussing the outcome of the project, it is useful to look at the teams that participated in the project, their experience and orientation. The make-up of each of the five teams is discussed below (see also Table 1.)

Argentina. IDEE, which administered the project, is a research/teaching institute that is part of the Fundacion Bariloche. It has twenty years experience in energy planning and is known throughout Latin America for its three-month course on the subject.

The team was made up of an engineer with twenty years experience in micro-hydro in the Misiones area; a senior economist from IDEE; several engineers from CREDMI (a micro-hydro center associated with the University of Obera), and a sociologist from the University.

The team combined expertise in rural energy issues, technology development and needs assessment with a good working knowledge of the project area. Together with Dr. Bhatia from India, it was the most experienced of the RETAIN members. However, its participation in the network was hampered by language barriers and poor presentation and translation of research results (see section 3.1)

China. The Chinese research was carried out by an institute that is part of the Institute of Nuclear Energy Technology of Tsinghua University, Beijing. The team consisted of four engineers with experience in systems analysis and modelling energy demand. Members of the team are also part of the EEC energy planning network and have hosted training sessions on rural energy planning for this network. However, the team did not have much practical experience in rural energy technology diffusion.

Because of the strong central planning orientation in China and the unusual degree of state control, this team brought to RETAIN a unique cultural and socio-economic perspective. They had some difficulty in understanding the RETAIN research issues, such as the importance of selecting appropriate technologies and the difficulties of finding appropriate mechanisms for technology diffusion, since these issues were either not perceived or recognized in the Chinese situation. There were also some difficulties with language.

However, all participants interviewed said that the team's English and their understanding of RETAIN issues improved over the course of the project. The network adviser felt that the Chinese team had benefited from the network, especially in learning about what was important about their experience for others.

Costa Rica. The Costa Rican team was based at a non-profit research center interested in development issues. The team was nominally led by an experienced engineer and economist. However, at the start of the project, he was appointed Minister of Energy and delegated most of the research to an inexperienced colleague. This team then became the weakest member of the network.

The research study became a general description of the rural energy situation in Costa Rica that failed to come to grips with any of the RETAIN issues. Although there had been a large stove dissemination project in Costa Rica that would have provided a good basis for a RETAIN study, this experience was not examined.

India. The Indian research was undertaken by Dr. Ramesh Bhatia, who has been referred to as the "intellectual father of RETAIN." He is a professor of economics who has specialized in the development of analytical methods and empirical evidence for making choices among small-scale energy technologies, especially for water pumping. He has a great deal of relevant experience in energy planning and in field investigations of rural energy interventions.

Dr. Bhatia acted as both a country researcher and an adviser at the network meetings and planning sessions. He was an active participant in the meetings. As a link between the teams and the advisers, he was a valuable addition to the network.

Philippines. This team was based at the Asian Institute of Management (AIM), a non-profit teaching institute in Manila that also carries out consultancies. The team was made up of two AIM professors (one holding an MBA, the other an MBA/MSc in Energy Management and Policy) and several engineers from the institute.

The team had little experience of rural energy or research. However, it was hoped that their management experience would provide insight into the institutional side of technology diffusion. Since the Filipino/USAID gasifier project was one of few example of large scale diffusion of renewable energy technology, this case study was important for RETAIN.

Diversity of the Teams. The teams had very different interests, backgrounds and orientations. The teams also had varying degrees of experience with energy planning and rural energy technology issues.

Each team had its own research objective. The Argentinian team wanted to develop a methodology for evaluating and planning site-specific energy interventions. The Chinese team was very interested in modelling the rural energy situation, and evaluating energy technologies in the context of this model. Dr. Bhatia was interested mainly in economic issues, especially micro-level cost benefit analysis. Finally, the Filipino team was primarily interested in developing Harvard-type case studies of management issues in a government sponsored rural energy project.

The diversity of the teams was double-edged. There were benefits to be obtained from different perspectives on rural energy technology assessment and innovation, but it was hard to develop communication among such diverse teams, especially since three of the teams were new to the types of issues being considered by RETAIN.

This had important implications for the network, since it would take time to build these common perceptions and create a strong basis for interaction among the teams.

3. QUALITY OF RESEARCH OUTPUTS

The research outputs consist of the final reports available from the project teams; the reports of the network adviser including review papers, the synthesis report, and the edited papers for the special issue of World Development; and reports from the meetings.

3.1 Final Reports

The quality of the reports should be judged mainly in relation to the RETAIN objectives. There was great variability in quality due to differences in research design, experience of the teams, and presentation (including translation.) The research studies of each of the teams are discussed below.

3.1.1 Comments on Individual Country Studies

Argentina. The Argentinian team developed and applied a comprehensive approach to evaluating a range of decentralized energy technologies for small-scale electricity production. The approach includes a needs assessment within the full socio-economic context, assessment of alternatives for supply, a comparison of the alternatives for suitability and cost, and consideration of the policy implications of the results.

The framework is comprehensive and several aspects of the work are innovative--the needs assessment, the method of identifying suitable sites for micro-hydro development, and the mapping of needs and available sites. While the original study did not look at institutional arrangements needed to introduce decentralized technologies, the follow-up research will remedy this.

The Argentinian research was the most complete and innovative of any of the teams. However, while the quality of the research effort was high as shown by background documents in Spanish and verbal explanations of research methods and results, the English documentation does not do it justice.

The translation of the first draft of the final report was so poor that even the advisers found it difficult to understand. The final report, while shorter and more comprehensible, does not document clearly the research effort. Some of the most innovative aspects of the work, on needs assessment and selection of micro-hydro sites, virtually disappeared from the English documentation.

The evaluation method developed by the Argentinian team could be used as a model for other areas and other technologies. However, before it will be of use to other researchers, the process of the work needs to be clearly documented, as well as the results. This requires a complete rewrite of the final report to eliminate some terminology that is inappropriate in English, and a focus on documenting key aspects and results of the work. The main report could be supplemented by technical papers on specific aspects of the research. The high quality and originality of the work justify putting more resources into clearly presenting the results.

China. The final report of the Chinese team can be divided into three main components--a section that analyses and forecasts rural energy demand using an econometric model, and one section each on the diffusion experience with biogas and micro-hydro plants.

A great deal of effort went into the forecast of rural energy demand. However, this work has little to do with the central issues of RETAIN. The sections on the biogas and micro-hydro programs make up only 40 per cent of the report. These sections focus on the experience with diffusion, giving little attention to the other RETAIN issues of energy needs, comparative analysis of technologies or policy implications.

Field investigations looked mainly at the performance of the technologies, while the history of the programs provide tantalizing glimpses of experience, with little analysis or detail. Some results of cost/benefit analysis at the micro and macro level are given, but with insufficient detail to judge the validity of the analysis.

The technocratic nature of the report and the lack of detail on economic analysis may be explained by the fact that the team was made up entirely of engineers, with little involvement of social scientists.

Language was again a problem. The report was written by the Chinese team in English and was not always clear or easily comprehensible.

However, the research makes an important contribution by describing for the first time the problems experienced in the biogas program and charting its evolution. The Chinese experience with biogas reveals surprising parallels with NRSE programs in other countries (including the Filipino experience with gasifiers)--too much emphasis on numbers installed as an indicator of success; lack of quality control and attention to operation and maintenance leading to equipment falling into disuse; and an ultimate move toward privatization aimed at carefully selected target markets.

Costa Rica. As noted previously, the Costa Rican report was the least relevant of the five country studies to the network. It does not deal with any of the four central themes of RETAIN. The report is a general description of the rural energy situation and the prospects for introducing improved stoves.

The problems with this research effort stem from the fact that the key researcher was made Minister of Energy early in the RETAIN project and, while nominally in charge, delegated the work to an inexperienced colleague. This researcher was then unable to define and complete the research as originally proposed.

While this situation was unavoidable, closer monitoring of the project during project design and implementation could have revealed the problem and possibly allowed it to be corrected. The Costa Rican team was the only one not visited by the research adviser during the project.

India. The Indian study contains a clear presentation of three case studies: one applying cost benefit analysis to small-scale pumping technologies; one illustrating other factors that need to be considered in technology diffusion; and one illustrating the impact of the macro environment on the potential for diffusion of a particular technology. The different components of the study are competently executed and presented, but the results are not integrated or interpreted for policy implications.

A second report was completed by Dr. Bhatia , as a follow-up to the first RETAIN report. This study evaluated the performance of wind generators established at a number of test sites in India, and applied cost/benefit analysis to determine their viability. In many ways, this is a more interesting and original piece of work than the first study. There are unique difficulties in valuing the power produced by decentralized sources in irregular and unpredictable patterns.

However, the report could benefit by incorporating performance data from other countries (including the United States), to give context to the Indian data. Since grid-connected, wind-power generation is most advanced in California, the study could also look at methods used to calculate costs and value power there.

Philippines. The report from the Philippines is a professionally prepared and presented case study. By conducting field investigations into the status of the biogas program, it showed for the first time the extent of the failure of the gasifier program for irrigation. By investigating the institutional arrangements for implementing the program, it identifies some of the underlying causes of the failure.

The main deficiency is its narrow focus. It describes the experience with diffusion of the gasifiers, but does not cover the other RETAIN issues of analysing energy needs, comparing different technological options and drawing conclusions for policy makers. These omissions are important since inadequate analysis of the need for irrigation and of technological options were contributing factors to the failure of the program, while the failure to distill lessons from the experience and draw out policy implications limits the usefulness of the study to other researchers.

3.1.2 General Comments on the Final Reports

RETAIN Framework. The original purpose of the project was to analyse and compare methods of rural energy technology assessment and innovation, using the country research as case studies. At the first RETAIN meeting, an effort was made to develop a common framework for the studies, based on the four central elements of the RETAIN objectives.

However, when draft reports were presented at the Manila meeting, three of the teams had narrowed the focus of their efforts. The Costa Rican report did not deal with any of the RETAIN issues. The reports from China and the Philippines concentrated on the experience with diffusion of energy technologies, giving little attention to the other three central issues of RETAIN: energy needs, methods for comparison of technological options and recommendations to planners and policy makers.

Two of the studies fully met the original RETAIN objectives--Argentina and India. These teams also based their research on a review of relevant work inside and out of their own countries.

Economic Analysis. The reports were meant to include comparative evaluation of options using financial and economic analysis at the micro level, under field conditions. This was to have been supplemented by consideration of special characteristics of different technologies, and investigation of differential impacts, recurrent cost implications, etc. At the macro level the reports were to investigate the implications of different options in terms of system costs, transaction costs, etc.

However, only the Argentinian and Indian reports contained strong economic analyses. The Argentinian and Indian teams used both economic and financial cost/benefit analysis at the micro and macro level. The Argentinian framework even includes indirect effects, such as employment generation and use of foreign exchange.

The Chinese report includes some economic and financial cost/benefit analysis at both the micro and macro level, but the presentation of data is often incomplete or incomprehensible. The Filipino study includes some comparative analysis of technologies, but bases the comparisons only on the cost of fuel.

Sound micro and macro analysis of the Chinese experience with biogas promotion or the Filipino experience with gasifiers, including all overhead costs, would have provided important new insight into these programs. Questions of who paid and who benefited could also have been usefully explored to investigate the ultimate impact of such programs. These questions were raised in the report outline proposed by the research adviser, but none of the teams attempted to answer them.

Interdisciplinary Integration. Rural energy work requires input from a number of different disciplines-- economics (policy decisions and programming), engineering (technology), anthropology/sociology (diffusion and impact). However, the project teams consisted mainly of engineers and a few economists. As a result, the teams placed little emphasis on analysing the needs and resources of the target groups for technology diffusion or evaluating its impact.

Only in the Argentinian study, which included a sociologist, was a survey done to establish perceptions of energy needs in the context of all needs of target households. The second phase of the Argentinian study will also investigate the community's ability to support the introduction of micro-hydro technology.

The teams from China and the Philippines would have benefited from more involvement of social scientists from different disciplines (especially economists, anthropologists and sociologists), as advisers during research design and implementation, if not as team members.

Gender Issues. The role of women in technology diffusion and innovation was not explored in any of the studies. Gender issues were absent from the reports (e.g., differential impact of technologies in terms of costs and benefits to men and women, effects on income distribution, etc.)

As an example of such issues, it would have been interesting to know what role women played in the Chinese biogas program. In the follow-up research on stove diffusion, consideration of gender issues will be even more important.

Gender issues were also not incorporated into the operation of the network. RETAIN was a male network. There were no women participants at any of the meetings, with the exception of the Argentinian sociologist who attended the final meeting. This is in marked contrast to recent meetings on renewable energy in Africa, where women have been present in significant numbers.

3.2 Reports by the Network Adviser

The Choice of Energy Conversion Technologies for Small-Scale Pumping Systems--a Review (prepared for Sussex Meeting)

This paper is a review of approaches to comparative evaluation of small-scale pumping systems that was prepared for the first RETAIN meeting. It exposes the limitations and methodological problems in micro-level cost/benefit analysis. These problems range from valuing the "unique" characteristics of certain systems to incorporating uncertainty about the future "macro environment". The review examines these and other issues in relation to four studies of pumping technologies that show substantially different comparative costs.

The study concludes by placing comparative evaluation of technologies in a larger context. It discusses the importance of institutional arrangements in technology diffusion; judging the appropriateness of a technology in relation to objectives; and recognizing the realities of the rural economy. This review foreshadowed the greater concern with institutional and macro factors that is fully expressed in the synthesis paper and the design for RETAIN II. However, the issues that it raised were not picked up in the team reports.

The Synthesis Paper

The RETAIN project outline required the preparation of a "synthesis report containing a comparative analysis of the final results of the individual studies." However, because of the lack of a common framework in the RETAIN studies, a comparative analysis was considered to be impossible.

All of the studies dealt with the experience of technology diffusion. As a result, the synthesis paper became a review of this experience. The paper discusses the changing perspective on technology diffusion and concludes by drawing out a set of basic principles to guide policy makers and researchers.

It makes a useful contribution to the literature by outlining key issues to be considered in rural energy technology diffusion programs. It also continues the theme of the above paper by emphasizing the importance of institutional arrangements in providing a basis for success.

However, the synthesis paper also illustrates the extent to which one of the central objectives of the original RETAIN was lost--the development of more rigorous methods for rural energy assessment and innovation.

Edited Versions of Final Reports for World Development

The network adviser prepared edited versions of the final reports for inclusion with the synthesis paper in a special issue of World Development. The edited versions of the papers are more clearly presented, more focussed on technology diffusion issues, and in some cases (China) include additional information.

There are indications that the special issue of World Development may be delayed. If this occurs, IDRC may want to publish the package of reports prepared for World Development prior to or as a substitute for the special issue. Early dissemination of research results would enhance the relevance of RETAIN.

However, the edited versions should not be seen as substitutes for the final reports. The original reports by the teams, while sometimes poorly written and presented, contain material that provides context and illustrates the research process. The Indian report has already been issued in IDRC's manuscript series. Efforts should be made to improve the reports from China, Argentina and the Philippines so that they also can be published in the series.

3.3 Outputs from Meetings

There are no proceedings from any of the RETAIN meetings. This is a significant omission since the meetings were pivotal events at which agreement was reached about research objectives, comments were made on draft reports, and plans were made for future actions.

The first meeting involved the teams and advisers in defining methodology and preparing a common draft outline for the report. In IDRC's Ottawa files, there are papers prepared for the meeting by some of the teams and the network adviser. There is also a draft report outline prepared by the adviser after the meeting, but no record of the meeting.

The second meeting was combined with a special training workshop for African participants. However, in IDRC's Ottawa files, there is only partial information on the agenda, a list of participants and copies of some of the papers presented. There is no documentation on the meeting itself.

The final meeting included brief presentations of final results and plans for the future of RETAIN. Again, documentation of the meeting is partial, including an agenda and list of participants, but no record of the meeting.

Proceedings should be prepared and circulated after all major meetings. Otherwise, a major part of the network activity is lost not only to outsiders, but to the participants themselves.

4. IMPACT ON TRAINING AND RESEARCH CAPACITY

The project made a major contribution to increasing research capacity in rural energy. This is especially important because the field is relatively new and undeveloped. It grew in importance after the 1981 Conference on New and Renewable Sources of Energy, which gave impetus to rural energy projects by international aid agencies and other groups such as NGOs.

However, many of these projects were small and isolated. This limited the accumulation of knowledge, which tended to occur mainly within international agencies where the results of different projects could be evaluated and compared. There were few individuals in developing countries who were able to obtain a broad range of experience, since conferences and seminars on rural energy are too short to allow in-depth exchange.

In this context, RETAIN was especially important. It provided the opportunity for researchers from different countries to analyse experiences and share the results. It also provided an opportunity for more objective analysis than was often found in renewable energy literature, which has tended to be dominated by advocates.

For three of the teams in the project, China, Costa Rica and the Philippines, RETAIN provided the first opportunity to work on issues of rural energy technology diffusion. The reports from China and the Philippines show substantial understanding of RETAIN issues. While the Argentinian and Indian teams had more related experience, RETAIN allowed them to develop their capacity for work on rural energy.

The project also had a considerable training impact--directly on participants as noted above, and indirectly in terms of strengthening training courses given by participating institutions. In Argentina, the RETAIN evaluation methodology provides material for 3 days of a 3-month course on energy planning given by IDEE to people from all over Latin America. In Manila, material from the RETAIN case study is used directly in courses on management of public sector projects. The use of RETAIN materials is less direct in India, although Dr. Bhatia also teaches courses to civil servants that are influenced by his RETAIN work.

The project may have had a training impact on outside participants who attended the RETAIN meetings, especially the Manila training workshop for African participants. However, since there was no documentation from the meetings or opportunity to interview non-RETAIN participants, it is impossible to judge this effect.

5. USEFULNESS OF THE RESEARCH

5.1 Policy Makers

In Argentina, RETAIN research has had considerable impact on government policy. It is being used by the electricity company in Misiones, which has created a special unit to develop micro-hydro plants in the region. It is also being circulated in the government-funded network of micro-hydro centers that includes CREDMI, to encourage other utilities to follow suit.

The RETAIN work is also being incorporated into the EEC sponsored energy plan for Northeastern Argentina, being developed by IDEE. The Department of Public Works in Misiones has put development of a project to establish micro-hydro plants in rural communities at the top of its agenda.

In addition, the Energy Secretariat of Argentina would like IDEE to develop a manual so that the evaluation method can be applied to other renewable energy technologies. The results of the research have been presented to several seminars in Argentina (including one of labor unions associated with utilities), Rio de Janeiro and Paraguay.

In the other countries, the research has had less impact on policy. By the time the study of gasifiers was completed in the Philippines, the government agency responsible for the program had been disbanded and the program cancelled. Since general lessons were not drawn from the case study, it is of limited use for policy purposes.

The work of Dr. Bhatia in India has been circulated to government departments and will be used by him in his role of advising the government on energy policy. In China, the RETAIN work documents policy shifts in the biogas program rather than providing new data or information that could influence policy.

The synthesis report draws out some major conclusions to assist planners in developing rural energy projects and is useful for policy development in international aid agencies and government. The combination of the synthesis report and short versions of the research studies, as proposed in the special issue of World Development, would be of most use to these groups.

5.2 Other Researchers

RETAIN proposed to develop an analytical framework for rural energy issues. The Argentinian and Indian studies and the synthesis report make important contributions in this area. While the Chinese and Filipino reports do not contribute to a research framework, they do provide rare critical analyses of two programs that have often been presented in the renewable energy literature as successes.

RETAIN research results have been presented at a number of international meetings. The Argentinian results were discussed at seminars in Rio de Janeiro and Paraguay. Dr. Bhatia's RETAIN research was presented at seminars on renewable energy organized at the International Center for Theoretical Physics in Trieste, in 1985 and 1987. Members of the Filipino and Argentinian teams introduced RETAIN results at a seminar organized by UNDTCD and OLADE on energy technology in Guatemala in 1988.

The results of the synthesis have also been presented in various forums, including the third and fourth Energy Research Donors Meetings (ERDM) in 1986 and 1988; and the UNITAR/UNDP Meeting on Energy for Rural Areas of Africa in Rome, 1988.

In addition, as noted above, outside researchers and donor representatives participated in the Manila and Argentina RETAIN meetings.

6. THE EFFECTIVENESS OF THE NETWORK

Since approximately 35 per cent of the planned budget for RETAIN and associated projects was for network related expenses (including the network adviser and the meetings), it is important to consider whether the network approach was appropriate and created benefits beyond individually funded research reports. This can be judged by looking at team interactions, the role of the network adviser and network meetings.

6.1 Team Interactions

According to project participants, there was limited interaction among the teams in the network outside of the meetings. In fact, the Argentinian and Filipino teams as well as the project adviser felt that this aspect of the network had not really worked. Even in the meetings, the interaction was strong between each team and the advisers but poor among the teams. None of the reports cites work done by other teams.

Some of the reasons given by the teams for their lack of interaction were the following:

- the teams had very different interests and orientations;
- they did not see the relevance of the research of other teams to their own work;
- they were not given the reports of the other teams sufficiently in advance of the meetings to be well prepared for the discussions;
- the meetings were not long enough for in-depth discussion of each team's work;
- there were problems of communication because of language, culture, and the fact that the teams had no previous experience in working together.

However, the interviews revealed a more fundamental reason why exchange among the teams was limited. With the exception of Dr. Bhatia, the teams saw their role as the production of research reports, as specified by their contracts with IDRC. The tasks of commenting on research reports by other teams, or comparing and analysing methods were seen to belong to the advisers.

While the participants interviewed felt that the network had not worked effectively, they supported its continuation. Language has become less of a barrier as the English spoken by the Argentinian and Chinese teams improved. (Some members of these teams are also members of the EEC Energy Planning Network, increasing their exposure to English and planning methods.) Participants felt that the potential for interaction had increased as the teams had grown to know each other and gained confidence in the area of rural technology diffusion.

6.2 Adviser/ Consultants

The network adviser was Andrew Barnett of the Science Policy Research Unit (SPRU) at the University of Sussex. Mr. Barnett, an economist formerly with IDRC, has extensive knowledge of rural energy issues and technology diffusion issues.

The adviser wrote papers for the network reviewing the literature on assessment of energy technology for water pumping and on the factors affecting rural technology diffusion. He also prepared a framework for the preparation of final reports and a framework for the presentation of case studies by African researchers at the Manila meeting.

He organized three RETAIN meetings, including two that required substantial outside promotion and preparatory work. He also ensured that all five research teams delivered final reports, prepared a synthesis report that drew together the threads of the studies, initiated the idea of a special edition of World Development on RETAIN, and edited the final reports for inclusion in this issue.

All participants interviewed mentioned the enormous contribution of the network adviser to their individual research efforts and reports, and to the RETAIN meetings. He contributed especially by assisting with research methods, commenting on reports, and identifying weaknesses in research efforts.

The budget of RETAIN provided for the participation of other consultants. However, this part of the budget was considerably underspent. Only one consultant was involved in the network meetings-- Dr. Russell de Lucia. He is an internationally renowned energy expert, experienced in both economic analysis and energy technology. Participants clearly valued his technical expertise and his ability to animate discussion.

The absence of any consultants from the social sciences (sociologists, anthropologists, rural/community development) is a notable lack. There is also a great deal of experience on technology diffusion in the agricultural sector that could have been tapped to assist in research design and methods.

6.3 Meetings and Field Trips

The meetings were at the heart of the network. They were the only mechanism created for direct communication among the teams. Unfortunately, proceedings were not prepared after any of the meetings. Because of the lack of documentation, the following comments are based mainly on interviews.

Three meetings were held--a three-day workshop in January, 1986 in Sussex to discuss methodology for the country studies; a two week meeting in October/November, 1986 that combined a one week field trip to China with a one-week training workshop in Manila to discuss the RETAIN draft reports and special case studies prepared by African participants; and a final ten-day field trip/meeting in November/December, 1988 in Argentina, to discuss the project's results and future.

The last two meetings were used to create awareness of the RETAIN project, to encourage new groups to join the network, and to interest donors in the future of the project. The lack of an African team in the RETAIN network was felt to be a failure by

the network adviser and by IDRC. A major reason for combining the second meeting with a training workshop for African researchers and for inviting outside researchers to the final meeting was the continuing search for an African team.

However, the RETAIN teams interviewed indicated that outside participants had distracted attention from the discussion of research methods and results, especially in the Manila meeting. As a result of the enlarged focus of the meetings, the time allocated for presentation and discussion of their research was too short to create understanding or exchange (first meeting--1 hour; second meeting--2 hours; third meeting--40 minutes.)

While there were good reasons for involving other participants in the meetings, sufficient time was not set aside for separate discussions among RETAIN members, to focus on research methods and the results of each of the studies.

The two field trips were of equal length with the workshop sessions. While field trips provided valuable opportunities for informal contact and learning about other countries, shorter excursions could have achieved these objectives at less cost.

6.4 Common Methods/Approaches

The intention of the project was to develop a common focus and methodology for the research teams. The pre-RETAIN meeting in 1984 and the first meeting of the teams in Sussex in 1985 discussed these issues. Based on the Sussex meeting, the network adviser prepared an outline of the final reports. This outline is a detailed version of the elements of the original RETAIN proposal.

However, the actual research reports varied in focus and in methods, making it difficult to compare results. The research adviser has indicated the difficulty of developing common approaches in some internal project documents and implied that it may not even be appropriate. However, The Chinese and Filipino reports would have been stronger if they had covered the four central elements of RETAIN, as did the reports from India and Argentina. The RETAIN framework was appropriate to all of the studies, although some of the teams chose to exclude certain RETAIN issues from their work, or did not see their relevance.

With hindsight, it is clear that the development of a common approach would have required more time and more resources for the adviser and the teams to work together on individual research designs, especially in the definition of approaches and methods.

6.5 Institutional Aspects

RETAIN was seen as a one-time project, not as an institution building process that would need time. The network itself was not seen as an institution because there was no regular form of communication (e.g., through newsletters), no fully dedicated staff and no central location. As a result, the teams did not see their studies in relation to a larger or longer term effort. This may have contributed to their preoccupation with their own research and lack of interaction.

Consideration should be given to organizing further RETAIN work using the concept of institution building rather than the project concept. This would give the network concept more support and visibility, as well as allowing longer-term planning.

6.6 Overall Network Effectiveness

While some of the aspects of the network did not work as effectively as planned, there is no doubt that the network generated momentum that contributed to the research output produced. All of the teams completed final reports. Three of the teams proposed and are now executing follow-up studies. The synthesis report builds on the individual reports in order to identify the main issues in rural energy diffusion programs. The research output of the RETAIN network is substantial enough for plans to publish the results, in summary form, as a special issue of World Development.

However, the project did not create much interaction among the teams or cross-fertilization of ideas. Each team remained primarily interested in its own research and did not appreciate the relevance of the work of the other teams. Some of the reasons for this relate to the diversity of the teams (different orientations, languages and cultures.) Others were organizational (lack of common framework in the studies, meetings that did not focus enough on team reports.) Still others were perceptual (the role of evaluating was assigned to the advisers.)

While all of the networking aspects of RETAIN did not work well immediately, building a network is a process. Time is needed to develop relationships, common perspectives and approaches. RETAIN began that process and laid the foundation for more effective networking in further phases. The time frame of the project (originally 30 months, finally 46 months) was far too short to create an effective network. However, the fact that all of the participants are interested in continuing and new groups are interested in joining is an important indicator of its value.

7. FOLLOW-UP RESEARCH

7.1 Justification

There were some weaknesses in individual research efforts, and the networking aspects of the project were less than effective, but the achievements of RETAIN were considerable. The project contributed to the development of research capacity on rural energy technology diffusion in the developing world. It also provided a critical analysis of several "successful" projects (biogas in China and gasifiers in the Philippines, contributed to research methods (Argentina and India), and illuminated the main issues that need to be considered to develop effective technology diffusion programs (the synthesis report.)

The research output was considerable and effective dissemination of the results has already started and will continue. Additional evidence of success is given by the interest of the research teams, the network advisers and IDRC in a project extension.

However, the RETAIN project only began the process of fulfilling its original objective, in terms of analysing and comparing methods of rural energy technology assessment and innovation. A second phase of the project could build on the results of the first: several of the teams have gained experience in rural energy that will make them more active members; personal relationships have developed that will facilitate communication; and there are opportunities to add new teams that can bring additional strength to the network.

Agencies are gradually changing their perspectives on rural energy work, incorporating it into agricultural development work or into work on the environment. However, the problems relating to needs assessment, technology development and choice, technology diffusion, and assessment of impact remain. Continuation of RETAIN could provide a forum for exploration of methods and experience in all of these areas.

7.2 Scope and Focus

The final RETAIN meeting in Bariloche proposed that the second phase would concentrate on developing an understanding of the institutional and organizational factors that facilitate provision of energy and related services and technologies for given end-uses under varying conditions. The research method proposed is one of comparative case studies.

Since institutional arrangements emerged as key factors in the effectiveness of technology diffusion in RETAIN, this is a logical focus for the next phase. However, care should be taken to maintain the overall intention and the broad framework of the

original RETAIN. That is, the objective should be to develop methods that will assist in developing more effective rural energy policies and interventions.

All aspects relevant to rural energy analysis should be included in the studies-- including an analysis of need and resources of the target group, selection of intervention (not necessarily a technology), aspects of implementation (emphasizing institutional aspects) and policy implications.

One of the identifying characteristics of RETAIN was the breadth of the framework that was to be applied to the country studies, especially as seen in the report outline prepared by the network adviser. This framework should remain the basis for continued RETAIN research. However, it is important to recognize that the nature of work in rural energy is changing, as noted in the previous section. Energy work is being integrated more into other rural development efforts and its impacts are being judged in relation to broader development objectives.

Care should also be taken with the idea of comparative case studies that will look at success/failure experiences. Such studies are likely to be descriptive rather than analytical. Descriptive case studies should be avoided in RETAIN II.

7.3 Organization/Approach

If RETAIN II is to succeed as a network, the network needs to be given more emphasis in the organization of the project. The teams need to see their individual studies in the broader context of the RETAIN objectives and framework. Work is needed to clarify this framework, which should be defined at the beginning of the project, but will change and adapt as experience is gained through the country studies.

The country studies need to be seen as attempts to develop and apply the research framework. Meetings then need to focus on development of the framework, looking to the case studies as applications or demonstrations of particular methods.

The development and application of a framework for research to the individual country studies will require a different approach than was taken in RETAIN. It will require more resources for work on the individual research design, more monitoring during implementation, and a more critical evaluation of outputs. This has already been recognized in the proposed outline for RETAIN II.

Research Design. Research results can be improved if both the teams and the advisers spend more effort on the individual research designs, at the very beginning of the project. This needs to be done in order to ensure the following:

- that the research topic is relevant both to RETAIN and to policy makers in the individual country;
- that the research design is prepared using all relevant studies and information from inside and outside the country;
- that the research design incorporates method and analysis, including a stronger economic focus than in RETAIN;
- that sociological and gender issues are included in the research.

Composition of Teams/Advisers. The teams and advisers need to be more multidisciplinary. More women and social scientists need to be brought into the country and advisory teams. Advisers with experience in technology diffusion in other sectors could play a useful role in defining the a research framework for RETAIN II.

Monitoring of Research. In RETAIN, the network adviser made only one brief visit to each team during the entire project. More monitoring and opportunity for discussion is needed. The network adviser(s) need to make at least two one-week visits to the teams during the implementation phase, and to organize mini-meetings where issues of method and approach can be discussed. This will ensure that some degree of commonality is maintained and should improve both the quality of the outputs and the network dynamics.

Critical Evaluation of Outputs. The quality of the final reports needs to be improved in terms of organization and presentation of the research design, process and results. This could be done through a formal critical process involving written appraisals and comments by advisers and other teams, at different stages of the process. Review of draft reports by outside reviewers could be useful.

Network Meetings. The meetings need to focus on the work of the RETAIN teams, reducing the amount of time spent on field trips and the involvement of outside participants. More time needs to be spent on discussion of each team's research--perhaps one-half day per team rather than the 40 minutes to 2 hours during RETAIN meetings. It is also important that complete proceedings be prepared and circulated after all major meetings.

Organization/ Network Arrangements. The above process requires a more intensive use of resources at the center than occurred during RETAIN. The proposal for RETAIN II already incorporates this concept, including;

- a full-time adviser who will perform the functions of the current adviser, but with a more intensive function in monitoring and provision of relevant documents/information exchange;
- provision for several part-time advisers that could be assigned a monitoring role with specific teams;
- provision for a newsletter;
- provision for more communication among teams, more small meetings as a supplement to the main meetings, perhaps on a regional basis.

The teams need to be more aware of their role and responsibilities in the network. Contracts between the teams and IDRC should refer to the network as well as their individual research project, specifying that the teams will work within the overall RETAIN framework, and are expected to read and comment on the work of the other teams in writing and at meetings.

Funding Mode. RETAIN was conceived as a thirty-month project. Looking at the research objectives, it is clear that the time frame was too short. Building a network is a long-term process. While IDRC may be restricted to a thirty-six month time frame and the project mode, RETAIN needs to be recognized as a long-term program that is carried out in phases, rather than a single project.



INTERNATIONAL DEVELOPMENT RESEARCH CENTRE
CENTRE DE RECHERCHES POUR LE DÉVELOPPEMENT INTERNATIONAL

February 13, 1989

Centre File: 3-A-88-4242

Bogach Associates Limited
558 Cole Avenue
Ottawa, Ontario
K2A 2B5

Attention: Ms. Susan Bogach

Dear Ms. Bogach,

RE: Offer of Consulting Contract

This letter will confirm that the International Development Research Centre wishes to retain the services of Bogach Associates Limited in a consulting capacity for a period of up to 35 days between 15 February and 15 July 1989. It is a condition of this contract that the firm will ensure that the actual work is performed by Ms. Susan Bogach.

1. Terms of Reference

Under this contract, the services that are required of Ms. Bogach are as follows:

- a) to assess the quality of the RETAIN research outputs, both of the individual research components and of the network as a whole;
- b) to examine the utility of the Centre-supported research and the prospects for its utilization by different user groups including policy makers, practitioners and researchers;
- c) to comment on the appropriations and effectiveness of the project modality chosen, in particular the network approach and mechanism;
- d) to assess the project's training-related impacts including research capacity enhancement, professional development of researchers, development of teaching materials and institution building;
- e) to examine the research process and the modalities of interaction within the network;

- f) to comment on the need, focus and scope of follow-up research;
- g) to travel to South America, Asia and the United Kingdom to interact with three RETAIN teams and the RETAIN advisor;
- h) to submit a detailed and satisfactory progress report of the work accomplished to the Director of the Social Sciences Division of the Centre by 30 April 1989; and
- i) to submit a detailed and satisfactory final report of the work accomplished to the Director of the Social Sciences Division of the Centre by 15 July 1989.

Appendix 2

Evaluation Issues and Indicators

1. Quality of Research Output

To what extent did teams conform to research design of original RETAIN proposal?

- Exploration of need/end-use
- Identification of various appropriate technologies
- Comparison among technologies using cost/benefit analysis
- Consideration of diffusion issues, with emphasis on constraints and conditions for success

To what extent did teams explicitly consider research method in work?

- References to similar work inside or outside of country
- Interaction with other experienced researchers
- Evidence of multidisciplinary approach

Did the research design include appropriate economic techniques for calculating and comparing individual/social costs and benefits?

- Consideration of macro/micro costs/benefits
- Inclusion of both financial and economic analysis
- Consideration of "system overhead costs"

Did the research design incorporate a multidisciplinary approach?

- Composition of teams
- Incorporation of socio/cultural data in field investigations
- Consideration of community experience, resources

Were gender issues covered well?

- Consideration of women's roles technology diffusion
- Consideration of differential impact of technologies in cost/benefit analysis
- Field interviews with women
- Involvement of women on teams

Does the research contribute to the field?

- New information generated
- Research process and results clearly presented
- Development of new methods/approaches

2. Impact on Training and Research Capacity

What impact has the project had on training/ professional development of researchers?

- Exposure of participants to rural energy issues
- Use of project materials in training courses

What impact has the project had on Institutional capacity of participating institutions?

- enhancement of reputation
- introduction to rural energy issues
- evidence of likely continued involvement in research area

3. Impact on Policy Makers and Researchers

What is the actual/potential impact of the project on local/ national/ international policy?

- Involvement of official agencies in research
- Reception of research results by government
- Current or planned follow-up of research results

What impact has the project made on the academic and international research community?

- Presentation of research results at workshops, seminars, conferences
- Publication of results

4. Effectiveness of Network

Was there significant interaction of team members from different countries?

- Extent of team interaction at meetings
- Communication among teams between meetings
- References to other teams reports
- Direct comments in interviews

What was the contribution of the network adviser to the project?

- Extent of communication with teams
- Extent of communication among teams
- Extent to which approach of teams reflected common methods
- Contribution to quality of research output
- Completion of planned work

Was there evidence of cross-fertilization in research output?

- Referencing of one teams work by another
- Extent of common approach
- Comments by participants at meetings

Did meetings and field trips produce substantial benefits?

- Comments by participants
- References in reports
- Spin-offs

5. Recommendations for Follow-up Research

Is there justification for a continuation of RETAIN?

- Support by participants, advisers, IDRC staff, others
- Possibility of building on research results
- Evidence of project impact
- Institutional strengthening aspect

What should be the focus of next research project?

- Research method
- Research issues
- Relation to local/national policy

Should the network approach be continued and how should it be organized?

- Research teams
- Approach to comparability of country studies
- Role of adviser
- Duration/funding

ANNEX 3

Contact List

Argentina

Daniel Bouille	Senior Economist, IDEE
Eric Barney	Professor of Engineering, University of Misiones
Daniel Murgueza	Professor of Engineering, University of Misiones
Pedro Santandere	Director of CREDMI for Govt of Misiones
Hugo Bordon	Director of CREDMI for University of Misiones
Ing. Ross	Sub-Secretary Public Works, Misiones
Gallo Mendoza	Agricultural Engineer, IDEE

India

Ramesh Bhatia	Professor of Economics, Institute of Economic Growth, University of New Delhi
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Philippines

Francisco Bernardo	Professor, AIM
Gregory Kilayko	Professor, AIM
Felipe Alfonso	Associate Dean for Development, AIM

England

Andrew Barnett	Senior Fellow, SPRU, University of Sussex
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Itinerary

March	13	Ottawa/New York
	13/14	New York/Buenos Aires
	16	Buenos Aires/Posadas
	17	Posadas/Buenos Aires
	17	Buenos Aires/Miami
	18	Miami/Toronto/Ottawa
May	22/27	Ottawa/Nairobi (Separate Contract)
	27/28	Nairobi/Bombay/Delhi
	31	Delhi/Bangkok/Manila
June	2	Manila/London
	5	London/Brighton
	7	Brighton/Gatwick
	7	London/Montreal/Ottawa

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3. "Diffusion of Small Energy Technologies in Rural Areas of Developing Countries" by Hartmut Krugmann, Social Sciences Division, IDRC, Ottawa, Canada, March 1988. (A paper presented to the Experts' Group Meeting on Energy for Rural Areas of Africa organized by the UNITAR/UNDP Centre on Small Energy Resources, Rome, March 15-17, 1988.)
4. "Discussion Report for Retain Methodological Meeting" by Asian Institute of Management, Philippines, December 1985.
5. "Economic Evaluation and Diffusion of Renewable Energy Technologies: Case Studies from India" by Ramesh Bhatia, Institute of Economic Growth, Delhi, India, October 1987. (A Manuscript Report produced by IDRC, Ottawa, Canada. IDRC-MR162e.)
6. "Energy Delivery Systems in Rural Areas of China: A case study on irrigation in certain areas" by ITEESA, Beijing, China, December 1988. (A proposal for RETAIN Phase II.)
7. "Energy Delivery Systems for Rural Development: Case Studies from Three States in India" by Dr. Bhanwar Singh, Centre for Social and Technological Change, Bombay, India, December 1988. (A research proposal submitted to IDRC for RETAIN Phase II.)
8. "Institutional Aspects of Promoting Renewable Energy Technologies in India" by Ramesh Bhatia. A World Employment Programme Research Working Paper, WEP 2-22/WP 177, International Labour Office, Geneva, 1988.)
9. "Methodology of Appraising Alternatives for Electric Supply in Rural Areas" by the Institute of Energy Economics and the National University of Misiones, Argentina, July 1988.

10. "Methodological Report for RETAIN Meeting" by Instituto de Economia Energetica, Buenos Aires, Argentina, December 1985.
11. Papers Prepared for Inclusion in a Special Issue of World Development:
 - "The Diffusion of Energy Technology in the Rural Areas of Developing Countries: A Synthesis of Recent Experience" by Andrew Barnett.
 - "Diffusion and Innovation in the Chinese Biogas Programme" by Qui Daxiong, Gu Shuhua, Liange Baofen and Wang Gehua.
 - "Promoting Rural Energy Technology: The Case of Gasifiers in the Philippines" by Francisco P. Bernardo and Gregorio U Kilayko.
 - "Diffusion of Renewable Energy Technologies in Developing Countries: A Case Study of Biogas Engines in India" by Ramesh Bhatia.
 - "A Method for the Appraisal of Alternative Electricity Supply Options Applied to the Rural Areas of Misiones Province, Argentina" by Daniel Muguerza, Daniel Bouille and Erik Barney.
 - "Establishing New Markets for Mature Energy Equipment in Developing Countries: Experience with Windmills, Hydro-Powered Mills and Solar Water Heaters" by Christopher Hurst.
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