ENERGY FOR RURAL DEVELOPMENT

IMPLEMENTATION PLAN

FOR INTER-COUNTRY RESEARCH ACTIVITIES

1980-1983

Bangladesh
India
Indonesia
Nepal
Philippines
Sri Lanka
Thailand
United States

National Research Council of Thailand

East-West Resource Systems Institute

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April 1980

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PART I

INTRODUCTION AND SUMMARY

INTRODUCTION

As a result of increasing energy demands to meet the basic needs of the majority of the population in developing countries as well as a rising demand for petroleum products to fuel the various economies, coupled with an exhaustion of traditional energy-related resources such as forests, it has become acutely necessary to find other appropriate sources of energies for the national economies in general and for rural economies in particular. A workshop organized by the National Research Council (NRC) of Thailand in cooperation with the East-West Resource Systems Institute (RSI) was held at Suriwongse Hotel in Chiang Mai, Thailand from February 5-14, 1980 to frame an implementation plan for research cooperation among eight countries on a set of critical issues affecting use and supply of energy for rural development. A previous workshop convened in May 1979 by RSI in Honolulu, Hawaii had accomplished a preliminary identification of these issues and had prepared four Indicative Research Plans with the unifying objective:

"To gain information and understanding that help policy makers and implementers in the area of energy and rural development to promote improved quality of life, more equitable distribution of income and resources, and the generation of employment in rural areas."

Members of the Research Implementation Workshop at Chiang Mai, of whom one-third had participated at the 1979 workshop, had these objectives:

1. To exchange reports on progress achieved to date in each focal area of the Indicative Research Plans.

2. To share substantive concepts, scope, analytical methods, and implementation procedures defined in each country and group research plan.

3. To identify needs for joint inter-country activities such as methodology and training workshops, exchange of researchers and bibliographic and technical information, test and demonstration projects, and research review meetings.

4. To plan and mobilize resources for the projected activities.

5. To define an operational workplan for project implementation.

WORKSHOP ORGANIZATION AND DECISIONS

The workshop participants elected Dr. Sanga Sabhasri as Chairman, Mr. Prapath Premmani as Co-Chairman, and a Steering Committee composed of the principal research coordinators from each country and from RSI.

Substantive research problems were defined and examined in plenary sessions during the workshop's first three days. Inter-Country Activity Planning Groups were then organized to develop research plans on each problem area.

The Steering Committee created a Research Committee and a Resource Committee. The Research Committee reviewed research plans as they were formulated by Inter-Country Activity Planning Groups. The Resource Committee assessed budget requirements and fund availability. Toward the conclusion of the workshop, the Research Committee framed an overall matrix of eight Activity Plans which the Resource Committee measured against funds available in the short term. On this basis, the Steering Committee formed an integrated minimum set of activities required to assess rural energy needs, resources, and technologies. This Core Program is designed to clarify policy and technology alternatives for meeting rural development objectives.

The final plenary session modified and approved the Core Program and agreed on organizational and funding steps for program initiation. The Steering Committee agreed to provide continuing coordination in the execution of the program. Dr. Sanga Sabhasri was asked by the workshop to serve as continuing Chairman and accepted. A drafting committee chaired by Dr. Sanga completed the Provisional Implementation Plan at Chiang Mai for distribution to participants and sponsoring agencies. As requested by the Steering Committee, the final Implementation Plan, incorporating corrections and revisions by participants and edited by Cynthia Shklov, has been prepared for publication by RSI.

The Steering Committee meeting in Honolulu tentatively scheduled for June 1980 to review decisions taken and to consider further required action on the inter-country program has been set by the Chairman for July 1-3, 1980.

THE CORE PROGRAM

The most important research problem identified by the workshop is to assess the energy needs of rural people in the context of energy resources in order to gain better understanding of policy and technology requirements for advancing rural development objectives. An iterative research process to clarify the relationship between rural energy programs and rural development objectives is projected. The research undertakes to account for the felt needs of rural people in both the formulation of rural development objectives and the planning and implementation of rural energy programs.

The overall objective of the Core Program is to clarify key energy policy and technology development issues faced in meeting rural development needs. It endeavors to understand the requirements for development and introduction of specific energy technologies. Specific objectives include:

1. Definition of policy issues, particularly those arising from uncertainties in the supply of energy for agricultural production and rural domestic needs, that would give focus to the development and application of relevant methods, technologies, and policy analyses.

2. Development of methods to assess felt needs and the bearing of these needs on technical, economic, and social attributes of viable energy technologies.

3. Refinement of methods to assess viability of technologies and to gain understanding of village characteristics and capabilities bearing on technology adoption. These methods will focus on specific technologies being developed by institutions who are participating in the program.

4. Progress in development and adoption of biogas and fuelwood technologies--and subsequently of other selected technologies. This program objective involves close interaction with the results of needs assessment, viability assessment, and policy studies.

In the Core Program, inter-country research cooperation is built around selected components of the eight Activity Plans. Activity Plan 1, "Rural Development Objectives and Assessment of Energy Needs," focuses the overall program on rural development needs and their implications for energy policies and technology development. Short-term policy issues to be examined include (1) energy constraints on agriculture and access to food, especially nutritional qualities; (2) effects of demand for fossil fuel substitutes on availability of cooking fuels; and (3) policy alternatives, such as price, tax, subsidy, or allocation measures, directed toward fuel conservation and substitution. The plan addresses longer-term issues and uncertainties, including (1) trends in noncommercial or quasi-commercial energy supply and demand; (2) determination of need-based parameters for new or improved technologies using renewable resources; and (3) policy priorities for allocations for research and development of new energy technologies.

Activity Plan 2, "Rural Development Energy Data Requirements," is motivated directly by the policy and assessment issues specified in Plan 1. Methodological advances sought in the plan focus on (1) data requirements for current policy analyses and (2) felt needs assessment and definition of attributes of viable technologies.

Activity Plans 3, 4, and 5 involve development, verification, and dissemination of specific energy technologies. Plan 3 seeks to optimize and widely disseminate biogas technology by reducing costs, increasing gas yields, and reducing seasonal yield variations. Plan 4 reviews the state of the art in fuelwood and biomass research in the participating countries. From this standpoint, the plan defines a research program that includes selection and trials of fuelwood species; study of soil and agroclimatic parameters and biological conversion processes of each species; and improved design of domestic stoves. Plan 5 provides for inventory and critical review in each country of technological developments--in hydro, solar, wind, and animal power for selected rural applications--and of appropriate energy mixes for rural development.

Activity Plans 6, 7 and 8 cover viability assessment of new energy technologies and factors in their successful introduction, adoption, and widespread use. Plan 6 identifies four methodologies for use and review in case studies that assess technical, economic, and social factors affecting the viability of new technologies. Plan 7 provides for study of both village social structure and the role of political and other institutions in promoting introduction of technologies. Plan 8 focuses on exploration of strategies for widespread introduction of technologies. This plan will emphasize linkages between sophisticated and simple technologies and transfer of technologies within and between countries.

In short, the first two plans' orientation to policy and needs analyses form a context and provide data for concrete technological development in Plans 3, 4, and 5. Technology improvements, in turn, will be assessed according to real-world applicability in Plans 6, 7, and 8. Research findings produced thereby will relate to both institutional and technological changes that are relevant to policymakers responsible for shaping energy programs to meet rural development needs.

PRODUCTS AND END-USERS

The integrative design of Core Program results can be seen from the perspectives of decision makers in different types of organizations and environments who might use these results. Specific results various users responsible for rural development and energy decisions could obtain from this program include:

Decision Area or User of Results	Intended Core Program Results
Rural development policy	Felt needs assessment (AP* 2B) as guides to sectoral or integrated area development planning and energy requirements (AP 1)
	Village area capabilities and characteristics for initiating development tasks and for introducing specific energy technologies (AP 7, linked with APs 3, 4, or 5)
Fuel supply, substitution and conservation policies	Analysis of liquid fuel demand shifts in relation to crop, rainfall, and irrigation patterns (AP 1 linked with AP 2)
Agriculture production policy	Fuel-specific constraints on irrigation and agriculture through secondary data analysis (AP 2A) supplemented by region-specific sample data (AP 2B)
	Inter-regional shifts in productivity potential; farm management implications of energy constraints (AP 1, AP 2)

Agriculture production policy, continued	Technology potential from new power sources for pumping (biogas, AP 3; hydro, direct solar, and wind, AP 5); from changing valuation and practices in use of organic manures (APs 2B and 7; biogas, AP 3; tree legumes, AP 4)
Food and nutrition policy	Above agricultural productivity factors.
	Energy constraints on nutrition; felt need assessments of food intake and variety; access to protein, by local crop and animal system assessment (APs 2B and 3).
	Cooking fuel access (APs 3 and 4)
Energy research and development allocation	Trends and shifts in new technology competitive outlook (AP 6; APs 3, 4, and 5)
Technology design and development agencies	Parametric design factors (AP 2B) both location-specific and (as research proceeds) systemic
	Viability evaluation factors (AP 6)
	Factors in technology acceptance (AP 7)
Farm operators	Evidence on returns to investment in fuel-substitution technologies (APs 2B, 3, and 6)
Household decision-makers	New options on sources of cooking fuel (APs 3, 4, and 7)
	Active mode of interaction with technology development and extension agencies (APs 3 and 7)
	New sanitation options, such as potential acceptability of use of human feces for biogas irrigation pumping plant (APs 2B, 3, and 7)

*AP = Activity Plans

FUNDING STATUS AND MOBILIZATION

Significant rural energy research and development efforts are underway in the eight countries represented in the Energy for Rural Development program. The ERD program seeks to support and extend these in-country research efforts. The Inter-Country Activity Plans are designed to enhance in very specific ways the advancement of energy and rural development research in participating countries.

Institutions engaged in or preparing for in-country research are at different stages of fund generation. Host institution and country contributions to inter-country plans are also at different stages of readiness. International agency funding for components of in-country and inter-country research are at different stages of negotiation. In this situation, it was necessary for the workshop to examine the budget totals for both in-country research and inter-country activity plans against the limit of resources available to start the program. Table 1 arrays the estimated host-institution and external resource requirements for inter-country activities and the related in-country expenses.

TABLE 1
RESEARCH BUDGET ESTIMATES

	Inter-Country Research Budgets		In-Country
Activity	Host Institution	External Funding	Budgets
1	$33,000	$153,800	$395,000
2a	38,190	118,350	407,538
2b	11,880	73,880	
3	27,200	178,640	1,347,000
4	62,800	299,000	554,227
5	21,000	65,000	603,800
6	13,140	120,185	270,000
7	13,140	120,185	270,000
8	23,200	113,460	305,000
Total for 3 years:	$243,550	$1,242,500	$4,152,565

FUNDING FOR IN-COUNTRY RESEARCH

Summaries of the budget estimates for in-country research activities developed by each Inter-Country Activity Planning Group are given on page 68. The degree of detail achieved in in-country budgets differs significantly among the eight activities because preparatory budgeting for the evolving research plans was at different stages. The iterative budget process meant only a few of the institutes represented could commit budgeted

resources at the time of the workshop. At this stage, therefore, in-country budgets are order of magnitude estimates, pending revision and review by country groups.

1. Host Institution and National Funding

Representatives of each prospective participating institution undertook to review and firm up the annual program budget for the respective Activity Plans over the three-year period and initiate action for institutional approval and in-country funding. Revised institutional budgets for each Activity Plan will be assembled and reviewed by the interim Activity Plans Coordinator. Concurrently, institutions participating in all Activity Plans in each country will send the revised budgets to the principal Research Coordinator for the country for review and sponsorship with national funding sources. These materials will be assembled for review and action at the July Steering Committee meeting.

2. Supplementary Support for Immediate Requirements

Budget processes in the several countries call for different lead times and many of the institutions concerned may not have the approval by the outset of the first year. Therefore, the Steering Committee examined a number of alternative possible sources for early funding of in-country research components. Two funding sources were identified as especially appropriate for immediate followup: The Science and Technology Policy Program of the International Development Research Centre (IDRC), and the United Nations' Interim Fund for Science and Technology for Development (IFSTD). The Steering Committee requested Dr. Sanga Sabhasri to forward the Provisional Implementation Plan to appropriate representatives of both organizations and requested Mr. Richard Morse to follow this initiative with direct discussions to obtain a preliminary assessment of the relevance of particular components for funding support.

FUNDING FOR INTER-COUNTRY RESEARCH

Estimated budgets for inter-country activities were worked out in close detail by each planning group and are included in each Activity Plan. The inter-country budgets summarized on page 69 show separate breakdown figures for host institutions' shares and the external funding requirement. The inter-country budgets are being revised and corrected further, but at this stage these budgets show close estimates of required resources.

1. RSI/AID Funding

The Core Program constructed by reviewing and integrating key components from each Activity Plan provides for essential linkages and communication among policy, technology, and assessment aspects of the program. Inter-Country budget requirements for this program are largely made possible by the Energy and Rural Development grant to RSI from the Agency for International Development. RSI/AID funds already available or subject to projected expansion and extension of the AID grant account for US$731,000 or 59% of the total externally funded requirements for

the inter-country activities and events ($1,242,500).

2. IDRC and IFSTD

The Steering Committee understood that the mandates of the IDRC Science and Technology Policy Program and the United Nations IFSTD encompass funding support for both in-country and inter-country research. Accordingly, the Steering Committee concluded that presentations to these two agencies should cover components in the inter-country activity plans that complement in-country research and thereby achieve the objectives of the integrated program.

3. Information Exchange and Clearinghouse System

The Research Committee recommended creation of an integrated information clearinghouse system to assure the exchange of information among participating institutions needed to accomplish the program established in the Activity Plans. A Preliminary Proposal for this system was reviewed by the Research Committee and the workshop plenary. The revised proposal, prepared for consideration by the Steering Committee, is presented on pages 63-84. With the understanding that Volunteers for International Technical Assistance (VITA) is in a position to use a portion of an energy grant received from AID to support energy information exchange programs, the Steering Committee requested RSI to explore prospective funding support by VITA for the Information Exchange and Clearinghouse System.

PART II

INTER-COUNTRY ACTIVITY PLANS

ACTIVITY PLAN 1

RURAL DEVELOPMENT OBJECTIVES AND ASSESSMENT OF ENERGY NEEDS

PROBLEM STATEMENT

How can rural development objectives be enhanced through the introduction or more effective use of energy in rural areas? A reiterative process is needed whereby governments can define and evaluate rural development objectives in light of assessments of the felt needs of rural people. The assessment of rural people's energy needs should be accounted for in the planning of rural energy development programs. This activity will address the following issues:

1. The relationship between rural energy programs and rural development objectives.

2. Accounting for the felt needs of rural people in the formulation of rural development objectives.

3. Accounting for the felt needs of rural people in the planning and implementation of rural energy programs.

METHODOLOGY

To answer the problem stated above, a two-tiered research methodology is suggested.

1. POLICY DESCRIPTION

a. Identification of policies that apply to rural energy development and an assessment of how these rural energy development policies enhance general rural development.

b. Identification of policies pertaining to rural development and an evaluation of how they address themselves to rural development objectives. (An initial identification of key policy issues is provided in the next section.)

2. FELT-NEEDS ASSESSMENT

a. Data collection by a survey of felt needs of the rural communities emphasizing rural development and rural energy development.

b. Analysis which will focus on a reconciliation of these felt needs with rural development and energy programs of implementing agencies. The proposed felt-needs assessment is aimed at modifying programs to match felt needs or to include measures that enable rural communities to redefine their needs in interaction with reformulation of rural energy programs. (A first definition of elements of these tasks is found in the next section.)

INITIAL PROBLEM DELINEATION

1. POLICY

Rural development policies which apparently affect energy utilization include:

a. Agricultural development policies, particularly those impinging on food production and industrial raw material production and extraction.

b. Quality-of-life policies ranging from access to food and nutrition, sanitation, and health services to education.

c. Price, tax, and subsidy policies on both agricultural inputs and outputs.

d. Redistributive policies which are aimed at modifying distribution of opportunities, wealth, and income.

e. Employment-generating policies outside the rural areas' agricultural sector.

Considerations of these broad policy issues are beyond the initial scope of the research, but specific questions are raised. Specifically, critical short-term policy questions bearing on rural development objectives arise from uncertainties spelled out here:

a. Constraints placed by rising energy demand, price increases, and temporary supply disruptions in fossil fuels on energy inputs to agriculture and access to food and nutrition.

b. Related effects on the demand for fossil fuel substitutes (for example, fuelwood and animal dung) and on the availability of fuels for cooking.

c. Possible policy alternatives (such as subsidy, price, quota, and tax) to respond to these fuel price changes and substitution effects. After these policy alternatives are identified, each one's direct and indirect effects on the attainment of rural development goals would be assessed.

Alternative fuels based on renewable energy resources are prominent among those affected by these supply and demand shifts and policy choices. Critical policy questions being faced now which have short-to-medium- and long-term impacts center on these factors:

d. Supply and demand relations of semi-commercialized and non-commercialized energy sources whose recorded prices provide uncertain guidance on trends and relative scarcities.

e. Feasibility and viability of new or improved technologies for greater or more efficient use of renewable resources. Information on such technological potentials is required for formulation of policy on (1) amounts and allocations of research and development funds, and (2) potential interfuel substitutability for rural development purposes.

f. Significant local and regional variations in technical and economic parameters that govern (1) successful design and development of new technologies, and (2) initial acceptability and subsequent diffusion of the new or improved technologies.

Resource and technology uncertainties (d, e, and f) interact directly or indirectly with nontechnological policy alternatives (a, b, c). These policy interactions must be directly addressed if energy policies are to effectively serve the rural population's felt needs.

2. FELT NEEDS ASSESSMENT

Rural people's perceptions of the relative importance of energy needs, compared to other concerns such as water, sanitation, housing, employment, or transport facilities, are important to the formation of policies which affect both rural development and rural energy development. The priority which people put on energy concerns can greatly affect the acceptability of new or improved energy technologies. Critical uncertainties and constraints relevant to policy formulation that can be illuminated by analysis of rural people's felt needs also include:

a. Level of purchasing power of rural producers and consumers and its effect in suppressing demand for energy.

b. The effects of barter and nonprice relationships on the perception of energy availability and scarcities.

MODES

1. Establishment of a research coordinating office in an appropriate country with functions such as:

a. Coordination of rural need assessment carried out in each country.

b. An information clearinghouse for work being done in participating countries.

c. Organizing seminars, workshops, and other meetings.

2. Establishment of a principal person or organization in each country to undertake:

a. In-Country research programs.

b. Coordination with related organizations within the country.

c. A liaison role with the research coordinating office.

3. Periodic seminars for inter-country comparisons:

a. Methodology workshop within six months.

b. Evaluation workshop one year after the methodology workshop.

c. Dissemination workshop three years after beginning of activity.

MANPOWER

The research coordination office will be staffed as follows:

1. One Principal Research Coordinator

2. One or two support staff

BUDGET (3 Years Consolidated)

	Host Institutions	External
1. Research Coordination		
a. Research coordination office		
Principal Research Coordinator (fellow)	$10,000	$20,000
Support staff (1-2)	5,000	15,000
Operations	5,000	10,000
Travel	-	3,000
b. Country Research Coordinators (7)	-	
Country Research Coordinators	3,000	12,000
Operations	-	5,800
Travel (6 x $1,000)	-	6,000
2. Information Clearinghouse		
Preparation of reports, newsletter and reproduction and transfer of documents among country teams	-	25,000

3. Inter-Country Workshops (3)
(excluding cost of RSI participants)

a. Methodology workshop		
Travel and 7 days per diem for 12 participants	-	$12,000
Local participants, secretaries, etc.	3,000	2,000
b. Evaluation workshop		
Travel and 7 days per diem for 12 participants	-	12,000
Local expenses as above	3,000	2,000
c. Dissemination workshop		
Travel and 7 days per diem for 24 participants	-	24,000
Local expenses as above	4,000	5,000
TOTAL:	$33,000	$153,800

ACTIVITY PLAN 2

RURAL DEVELOPMENT ENERGY DATA REQUIREMENTS

INTRODUCTION

This Activity Plan identifies two types of rural development energy data requirements. The first type covers the information required to guide immediate energy policy decision making. The second type of data, based on in-depth observations and surveys in selected locations, will serve in the assessment of possible technological interventions and an assessment of felt needs. The two types of data requirements are treated separately in the workplan that follows. The link between this workplan and those of other Activity Plans is shown in Figure 1.

A. DATA FOR CURRENT POLICY ANALYSES

PROBLEM STATEMENT

Policy issues in several countries in the region already have brought attention to the need for energy information generally and for rural energy data specifically. Rural energy data collection necessarily requires a clear definition of the policies to be addressed and the issues to be analyzed. These policies and issues in turn condition the methodology used and the data required. No single technique can answer all questions equally well. It is from these perspectives that this research implementation plan has been formulated.

Notice is taken of the clear database component in all the policy issues delineated in Activity Plan 1. Examination of Plan 1 reveals two general sets of current policy issues from which data needs can be assessed. The first is the need for (a) better understanding of rural development policies and the related role of energy; (b) energy demand and supply estimation; (c) projection of fuel demand estimates; and (d) assessment of short-, medium- and long-term supply options. Included here are the data required for adequate policy formulation in the areas of demand management and conservation. The second area, in fact a subset of the larger set of data requirements, is the data required to meet short-term contingency planning. These include the data for formulating and analyzing price policies, subsidies, fuel substitution (in the short term), and allocation of energy resources (rationing).

SIGNIFICANCE

Surveys have proliferated in the region. This situation may become expensive, but can be turned to valuable effect if experiences of survey design, implementation, and use are shared in systematic fashion. Cost-effective data-collecting methods could be developed together through a mechanism in which researchers from different countries working in this field discuss actual experience in survey design and methods and assess the utility of the collected data.

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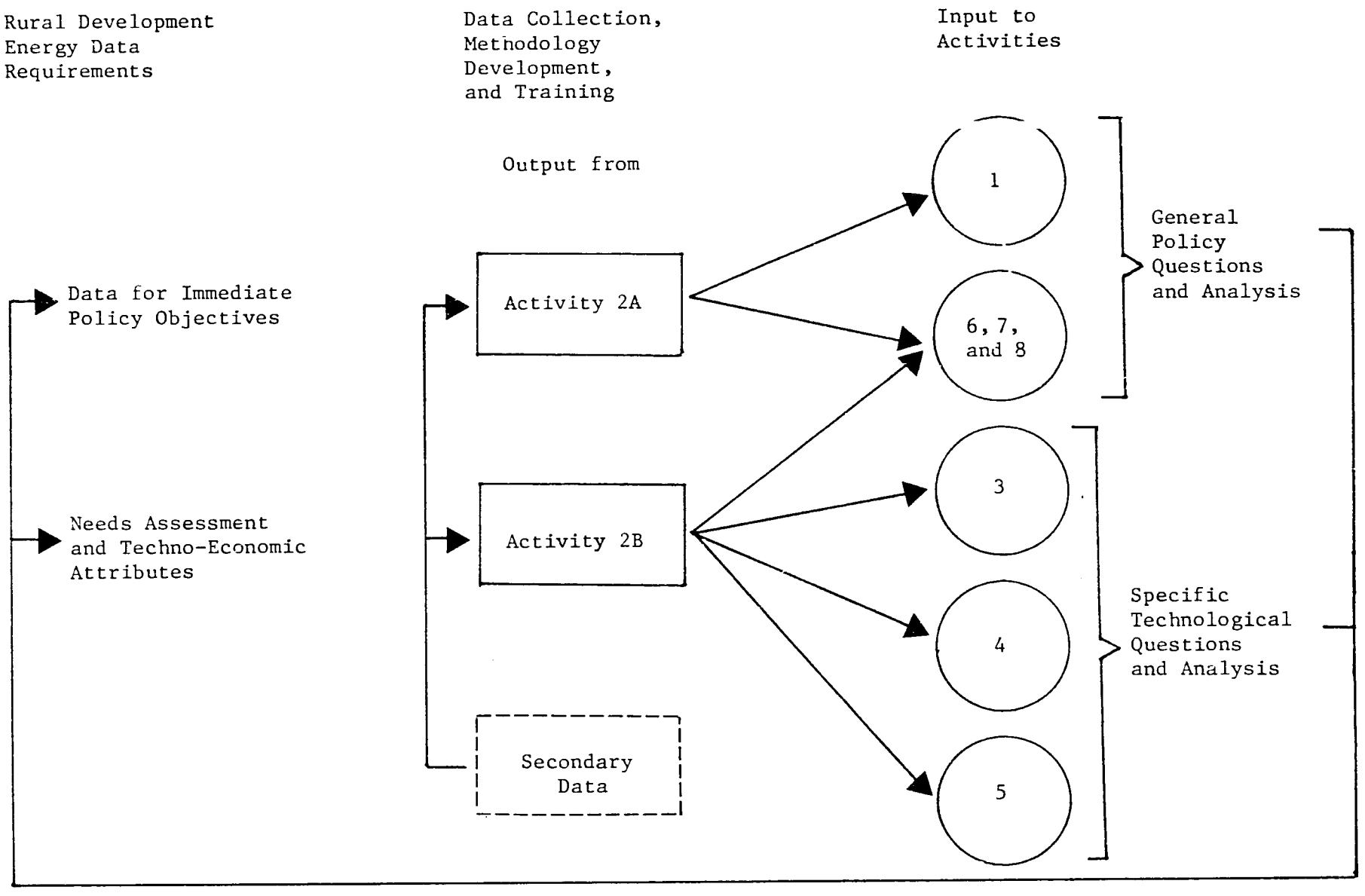

Fig. 1. Output of Activity Plan 2

OBJECTIVE

A number of continuing survey projects exist in several countries represented in this workshop; these are taking place in Bangladesh, India, Indonesia, Nepal, the Philippines, Thailand, and Sri Lanka.

This workplan is based on the points just raised and on the need to share the collected experience represented by these separate efforts.

SCOPE

The focus of the workplan is a consolidation of existing approaches to gathering data through an organized exchange of experience and methodological viewpoints.

The mechanism proposed to achieve the objective is based on a review of surveys being undertaken in selected countries. These surveys are summarized briefly:

1. In Bangladesh, an energy survey including rural energy has been made and data have been published in the "Bangladesh Energy Study, 1976" and the "Final Report by the Committee for Utilization of Indigenous Natural Resources of Bangladesh, August 1977." At present, with the assistance of International Development Research Centre (IDRC), the Chemical Engineering Department of Bangladesh University of Engineering and Technology is carrying out a comprehensive survey on a union comprising 23 villages. Some of the trends of energy demands and supply shown by this survey have been discussed in this workshop. Data analysis is in progress.

2. In India, the Appropriate Technology Development Association is undertaking a survey of energy consumption needs and availability in rural areas of four representative regions in Uttar Pradesh. Pretest data have already been collected. A questionnaire based on that data has been developed. The main objective of this data collection is to plan a long-term strategy for supply of energy to rural areas from renewable sources. Similar surveys were conducted earlier by the Institute of Science, Bangalore; the Center for the Study of Science for Villages, Wardha; and the National Council of Applied Economic Research, New Delhi.

A national data collection survey is planned now for five main regions--Northern, Eastern, Western, Central, and Southern--in a coordinated manner. This study may coordinate with other countries of Southeast Asia and South Asia, in view of the decisions from the Chiang Mai Workshop.

3. In Indonesia, an energy survey (by CSIS) covering 40 villages (523 households) and 60 rural industries is being undertaken. The villages were selected on the basis of the classification by the Department of Home Affairs. One major aim of this study is to obtain basic information to understand better the role of energy in rural development. Another aim

is to examine the potentials for fuelwood self-sufficiency at the household level. The study looks into energy flow patterns in villages and variations by regions. The household survey, based on questionnaires, direct measurements, and observations, collected data on the level and composition (structure) of energy consumption mechanisms and energy availabilities by income group. The industrial survey collected data on energy uses in the whole production process for the 20 main types of rural industries in West Jawa. This survey will be repeated at a proper time to capture seasonal variations. The collected data will be used to refine existing data and to help policymakers identify the effects of different policy options on the different income groups. The USAID had conducted an energy survey covering twelve villages in Central Jawa, East Indonesia, and South Sulawesi, in relation to rural electrification programs in Indonesia.

4. In Nepal, the EDRC (Tribhuvan University) conducted a rural energy balance research study at three sites, selected along a north-south axis, to represent the three ecological regions (mountain, mid-hill, and the plain). Besides collecting data on energy consumption and use (fuel, food and fodder, human labor and animal labor), an evaluation of available resources (exploited and unexploited) has been carried out to reach an understanding of the energy micro-balance. The study also will identify the constraints for technological change and development. The database covers general questionnaire and observation for 860 households and detailed data for 256 households. Analysis on the data is in progress.

5. In the Philippines, a nationwide survey by the Philippine Ministry of Energy covering 15,000 households has been completed. Its focus was to provide a better information base for certain immediate policy objectives, such as examining fuel substitution possibilities and developing an appropriate pricing policy for fuels. Emphasis was placed on developing structural information on fuel consumption, especially the noncommercial fuels. The survey results also will serve medium- and long-term policy decisions, such as examining supply options and introducing new energy technologies. On the basis of this survey, selected areas will be monitored continually. To obtain a more complete picture of the energy situation, an establishment (industrial and commercial) survey will be undertaken in the second quarter of 1980.

6. In Sri Lanka, the Ceylon Electricity Board surveyed six villages in a pilot study similar to the one conducted in Thailand. The methodology of the survey was the same, drawing on the same survey instrument, with modifications to account for local conditions. The scope of the data collected was similar. Information was collected on household energy utilization by end use activities (cooking, lighting, water, and transport), fuel requirements related to farming, the energy requirements of small-scale industry, and community level activities (health, sanitation, and education). Also included were basic data to estimate local energy resource potential. Data tabulation has been completed; data will be cross-checked and analyzed.

7. The National Energy Administration of Thailand undertook a pilot rural energy survey in six villages representing the major regions of the country. Approximately 100 households, selected to represent the main income groups, were interviewed. The objective of the survey was to test a method for constructing a rural energy database. These data will serve in (a) analyzing the structure of commercial and noncommercial fuel use; (b) assessing the potential for improved energy efficiency, and for conservation; (c) estimating the local energy resource potential; and (d) developing an integrated view of the energy delivery system in each village. The pilot survey will be followed by an expanded survey in which a larger sample of villages will be selected to provide a national baseline of information for policy formulation. Analysis of the pilot study data is now being undertaken.

ACTIVITY WORKPLAN

The implementation mechanism is based on these activities:

1. Exchange of both methodological and substantive information and resource persons (exchange scholars) for purposes of training and consulting. This would involve developing directories of available personnel at both national and regional levels. Some sort of clearinghouse mechanism would be necessary to link needs with available expertise. Two principal modes of exchange were identified:

a. Small groups would meet at a specified location to exchange information and techniques. These participants would then return to their respective countries to apply their knowledge and to train local cadres of research workers.

b. Experienced researchers would be available for training and consulting at the site where the need existed. Two principal advantages were identified. One is the possible two-way learning process when "experts" are faced with circumstances different from those present in their home situation. Also, over time, a body of training materials would be developed that would incorporate much collective experience and knowledge of many situations. Note that records of mistakes and other negative experiences should be included in information exchange.

2. Periodic inter-country workshops for country members to examine the collective experience of data surveys and new data needs as they emerge. The first meeting is proposed for August 1980. The workshop should have a specific objective, namely, to examine the approaches of the pilot studies conducted in three to five countries and, most importantly, to assess how the data has been and can be used by policymakers in the specific setting of the respective countries. A number of methodological and data-related needs and opportunities have been identified at the Chiang Mai Workshop. The following list is merely illustrative.

a. The need for preliminary assessment of secondary data availability. In cases where required data are not available, inter-agency cooperation is needed in planning and implementing data collection activities.

b. Potential problems of data management and analysis are often given inadequate attention in the research design and planning stages, and available techniques for constructing scales and other multi-item variables are not clearly understood.

c. Advantages and disadvantages are involved in the utilization of a common set of units of observation for different research projects. Assessment of both sides of this question needs to be made.

d. Multiple visits to the same set of sample sites are often desirable in order to detect factors such as seasonal changes and policy impacts. This procedure entails its own set of problems, which need thorough review. In addition, general purpose energy data sometimes can be gathered as part of regular socio-economic surveys, but difficulties are frequently encountered in selecting the appropriate information to be collected and in arriving at the precise wording of the questions. These problems require coordinated attention.

3. With the assistance of resource persons from the Asia-Pacific region, RSI has begun to develop a methodological handbook covering some of the major issues associated with energy database generation. Preliminary work on the handbook would be critically evaluated at the proposed methodological workshop. In addition, the deliberations of the workshop on common methodological problems would provide useful input for later revisions of the handbook.

4. As Activity Plan 1 recommended, a need exists for the establishment of a research coordinating office and appointment of a principal person or organization in each country responsible for periodic summaries of in-country activities to be communicated to the coordinating office.

TIMETABLE

	Year 1	Year 2	Year 3
1. Resource Person Exchange	———	———	---------→
2a. Inter-Country Workshops	→X——— (August)	———X (April/May)	---------→
2b. In-Country Workshops	→X——— (Sept./Oct.)	———X (June/July)	---------→
3. Methodological Handbook	———	———X (September)	---------→
4. Research Coordinating Office	———	———	———→

BUDGET 2A (3 Years Consolidated)

	Host Institutions	External
1. Researcher Exchange (16 persons) 2 weeks inter-country travel, 8 person-months		
a. $1,500 travel	-	$24,000
b. $490 per diem	$7,840	-
c. $200 honorarium	-	3,200
2a. Inter-Country Workshop I (excluding cost of RSI participants)		
a. In 7 Asian countries, 2 participants per country 1 week = 3.5 person-months x $1,000 per diem and travel + secretariat staff and local expenses	1,500	14,000
b. External participants (4) $1,500 travel + $245 per diem = $1,745 per person	-	6,980
c. Publication of proceedings	1,500	3,500
Inter-Country Workshop II (same as above)	3,000	24,480
2b. In-Country Workshops (one week in 4 countries)		
a. 20 person-months Travel and per diem and local expenses for 20 trainees each country	17,600	-
b. Resource persons, 3 per workshop = 3 person-months $1,500 travel + $245 per diem = $1,745 per resource person	-	20,940
3. Methodological Handbook		
a. Research fellows (3) 1½ months in host country + 1½ months at RSI = 9 person-months $1,500 travel + $2,250 stipend = $3,750 per person + local costs	6,750	11,250
b. Printing and reproduction	-	10,000
TOTAL:	$38,190	$118,350

B. METHODOLOGY AND DATA DEVELOPMENT FOR ASSESSING FELT NEEDS AND DEFINING ATTRIBUTES OF VIABLE TECHNOLOGIES

PROBLEM STATEMENT

In-depth information on the needs and resources of rural communities as well as the understanding of their relationship to locational and seasonal variation in cropping patterns are required to guide development of new energy technologies. Such investigations would have to assess both the general basic needs of the community as well as the specific techno-economic and socio-political attributes relevant to the introduction of new technologies. This information would be a very important data source for planning integrated rural development and for selecting appropriate energy mixes.

SIGNIFICANCE

In the rural areas, supplies of fossil fuels (coal and petroleum products) are generally scarce and supplies of traditional fuels (fuelwood, crop residue, animal dung) are growing short. This situation affects domestic, agricultural, industrial, and related activities. In the short term, this situation and its effects in rural areas may be rectified by increasing the supply of fossil fuels at subsidized prices, primarily for agricultural and other rural work, as well as conserving existing energy and substituting new fuels. In the longer term, considering the impending global fossil fuel crisis, policies would have to be adopted toward developing new energy mixes based on renewables and locally available resources. Data are required specifically for introducing new energy forms and for developing the necessary technologies as well as for augmenting the supply of traditional fuels, such as planting trees, to meet the various needs in the rural areas.

PROBLEM DELINEATION

Comprehensive understanding of energy potential in the context of needs and resources of rural communities will require focus on supply-demand relations of locally available energy sources like biomass, biogas, solar power, wind, and micro hydro. The technologies for these new energy forms are in various stages of development and have shown their utility in many experimental locations. Data for the introduction of these technologies on an accelerated rate would require the study of various factors. For example, data for the introduction of biogas technology are required to determine attributes of specific locations that define parameters for digester design and construction. Such attributes include: available materials for construction (gravel, lime, clay, distances from the availability of steel, cement supply centers); availability of raw materials for feeding the digester (animal dung, organic material, and water hyacinth); seasonal and ambient temperatures of the location; topography, land form and land availability; water table; sub-soil structures; and

neighborhood patterns, family size, and other socio-economic factors. A similar categorization and list of attributes will have to be prepared for the introduction of other new energy technologies.

New concepts and methodologies are needed urgently for identifying attributes that systemically influence locational variations in rural needs and energy source potential and for examining their systemic effects on technology parameters. Close inductive study as well as deductive formulations are required.

Secondary data and information available with agencies including government planning offices, local bodies, and meteorological offices are also useful sources. However, scientific data like species of trees and usefulness of various organic material in a biogas plant must be generated by those who are carrying out research in that particular technology (Activity Plans 3, 4, and 5).

The cultural and anthropological basis of certain traits and characteristics also must be determined to design a suitable technology for actual field conditions. The technology of solar cookers may quite possibly fail because people have a habit of cooking in squatting positions inside the house and do not like to cook outdoors or in standing positions. Similarly, cow dung may not have any other use except for burning as a fuel because of the difficulty in transporting manure to lands situated at long distances and in some areas due to waterlogging or difficulties in transport. As such, people may have a preference for chemical fertilizers which can be easily carried in concentrated form.

However, the most important data to be collected are in relation to peoples' felt needs. Acute scarcities might be felt in principal tasks, such as cooking, irrigation, agricultural operation, and industrial activities. But again, the question is, who feels the need, the people themselves or outside agencies. No doubt the most important felt need of the people is food and, in some cases, that need is satisfied by eating wild grains, roots, leaves, and pickings. Immediate solutions to these actually felt needs may not be impossible to find. Nevertheless, in many cases, long-term solutions to this problem will have to be found by people responsible for planning for the future. The felt needs of people generally are not expressed due to ignorance, suppressed desires, or lack of purchasing power. Collection of information and data will have to account for the existing and projected needs for a better life. The felt needs can be divided in these categories:

1. Household needs for cooking, boiling water, lighting, sanitation, water supply, and transport.

2. Agricultural operations like irrigation, tilling, sowing, weeding, and harvesting.

3. Agricultural processing like grain separation and further processing like milling and jaggery making.

4. In-village and inter-village transport.

5. Industrial activities.

6. Recreational, cultural, and education needs.

Cultural variations in all the above-mentioned activities must be studied in-depth for planning new energy-technology mixes.

For purposes of technology design and selection, needs also can be divided into energy categories of direct burning; medium temperature needs, like cooking; high temperatures for pottery and smithy work; mobile mechanical energy, like agricultural operations, processing, and transport; stationary mechanical, like small industry and pumping of water for irrigation and drinking; and low temperature uses, like refrigeration.

OBJECTIVE

A fundamental objective, by conducting comparative in-depth studies of selected regions, is development of conceptual formulations and analytic methods for identifying and classifying locational and socio-economic attributes that influence the definition of rural energy technology parameters. A closely related objective is the development of improved approaches to the understanding and assessment of felt needs. An immediate objective of specific studies is to make available techno-economic guidance to researchers engaged in design, development, and assessment of specific technologies (Activities 3, 4, 5, and 6).

SCOPE

By development and testing of such conceptual approaches and methods, the scope of particular studies can be progressively sharpened. In the design of each study, necessary detail can be weighed and selected according to characteristics of the subregion, such as:

1. Pattern of domestic energy consumption for the economically weaker section, middle income group, and high income group; assess the problems and translate them into felt needs (like more convenient cooking fuel and piped water supply).

2. Pattern of rural industrial energy uses by workers like potters, blacksmiths, and fishermen; assess their problems and translate them into felt needs (for example, better kilns, better forges, and better fuels).

3. Pattern of energy consumption for agricultural operations and processing; translate the problems into felt needs.

4. Pattern of energy consumption in other miscellaneous activities like transportation and cultural, recreational, and educational activities.

5. Availability of various resources in each region.

The scope of these studies also will have to be defined in terms of cultural and traditional life patterns of people in each rural community. This means taking into account habits and customs in cooking, washing, agricultural, and other operations which may have deep social and anthropological roots not perceived by the persons conducting interviews.

If the data are meant for national policy formulations, the sample villages for each representative region will have to be carefully selected to accent various characteristics, traits, logistical difficulties, traditions, industries and crafts, climatic conditions, crops, as well as availability of various resources like cattle dung, wind speed, solar intensity, temperature variation, and potential water energy.

These data with their socio-political and anthropological overtones cannot be generally collected unless the investigators are fully aware of the life pattern of the area and are also trained in data-collecting methods for this specific purpose. As far as possible, intelligent persons can be drawn from the villages themselves and given a thorough training in collecting these data.

Data on resources (including human, animal, trees and their species, crop, water, and relevant wind) have to be collected. A projection for the future can also be made of the dwindling resources like trees and animals according to past experiences. The investigators will have to be conversant with the present technology development of the nonrenewable resources and intelligent enough to assess the potentiality of the resources.

WORK PLAN

1. In-Country Research: Progress with in-country research individually or institutionally.

2. Exchange of information.

3. Inter-Country Assessment Workshop I to assess and refine methodologies: October 1980. Location: Nepal or India. Duration: one week Participants: two per country and one or two from RSI.

4. Researchers Exchange: Three or four inter-country exchange visits each year.

5. Publication of Studies: Yearly.

6. Inter-Country Assessment Workshop II at the end of the year. Location: Asia. Duration: one week. Participants: two from each country; one or two from RSI.

OUTPUT/TIMETABLE

	Year 0	Year 1	Year 2	Year 3
1. In-Country Research	X	X	X	X
2. Exchange Information	X	X	X	X
3. Inter-Country Assessment Workshop I		X		
4. Researcher Exchange		X	X	X
5. Publication of Studies		X	X	X
6. Inter-Country Assessment Workshop II				X

BUDGET 2B (3 Years Consolidated)

	Host Institution	External
1. Inter-Country Assessment Workshop I (In Asia)		
a. 14 participants for one week 3.5 person-months x $1,000 per participant (per diem and travel)	-	$14,000
b. Secretariat staff and local help	1,500	-
c. Resource persons (2) $1,500 travel + $245 per diem = $1,745 x 2	-	3,490
d. Publication of proceedings	1,500	3,500
2. Inter-Country Assessment Workshop II (same as above)	3,000	20,990
3. Researcher Exchange (12 participants)		
a. 2 weeks inter-country travel for 4 exchange researchers per year x 3 years = $1,500 travel	-	18,000
b. $35 per diem per person	5,880	-
c. $200 honorarium per person	-	2,400
4. Publications		
a. Editorial and secretarial services		9,000
b. Printing and reproduction		2,500
TOTAL:	$11,880	$73,880

ACTIVITY PLAN 3

TECHNOLOGIES: BIOGAS

PROBLEM STATEMENT

The worsening international energy crisis will adversely affect the development plans and, consequently, the life style of the people of all countries, industrial and developing. Experts forecast that, at the present rate of consumption, fossil fuel reserves will be exhausted in the near future. The consumption rate however will continue to grow as both population and development activities increase. Due mainly to the population growth, increased consumption of fuelwood and biomass for cooking in the rural areas of developing countries exceeds the regeneration rate. This causes severe hardship in rural areas and leads to an ecological imbalance over time. Therefore, utilizing some alternative sources of energy becomes imperative, both to conserve fossil fuels and to arrest deforestation.

SIGNIFICANCE AND RATIONALE

Biogas is a fuel gas obtained by anaerobic fermentation of animal and vegetable wastes. The technology is simple. It consists of processing the wastes out of air contact and tapping the gas produced for cooking, lighting, and other uses. The residue after gas evolution is used as fertilizer. The raw materials are available in the rural areas in abundance, so biogas might well serve as an effective substitute for fossil fuel and fuelwood, especially in the rural areas of developing countries. Unfortunately, because of some uncertainty in the present status of biogas technology, widespread adoption of the technology in the rural areas has not yet occurred.

OBJECTIVE AND SCOPE

The main objective of this research plan is the optimization and dissemination of biogas technology. Research is needed for reducing the cost of biogas plants, increasing gas yield, and decreasing seasonal gas-yield variation. The present cost of about $650 for a family-sized biogas plant (100 cft gas/day) is too high for the average rural family in developing countries. Further research is also needed on use of active methanogenic bacteria, biogas-based integrated farming systems, development of biogas-powered appliances, and utilization of organic wastes other than animal wastes. Advances on each of these problems would make the biogas technology more viable.

RESEARCH RESULTS AND EXPECTED USERS

Researchers will help optimize design, lower the construction costs, and expand the availability of raw materials and the use of products. In this way, biogas technology can be brought within the reach of the common rural people and also be made suitable for industrial and other uses.

INTER-COUNTRY RESEARCH PROJECT ISSUES
(Listed by priorities--see Table 2)

1. Design Improvement and Cost Reduction of Family- and Community-sized Plants. Considerable amount of work is needed on:

a. Cost reduction of biogas plants

b. Increasing gas yield

c. Reduction of seasonal variation of gas yield

d. Utilization of organic wastes other than animal wastes

2. Microbiological Studies

a. To discover the extent of increase in conversion and rate of gas yield by use of special strains of methanogenic bacteria

b. To isolate bacteria and study effects at various temperatures

3. Biogas-Based Integrated Farming System

a. To optimize land use and cropping pattern for energy and nutrition

b. To develop inland fisheries through biogas

c. To recycle byproducts of systems

4. Development of Biogas-powered Appliances and Machines

a. To develop burnt clay and other low cost burners for household use

b. To develop welding appliances

c. To develop lamps

d. To utilize biogas in internal combustion engines

e. To develop storage systems for biogas

MECHANISM FOR COLLABORATION

Various modes of collaboration for the inter-country research project would be used.

1. Abstracted Directory and Bibliography

Easy and unhindered flow of information is an essential prerequisite for successful team research. Directories and bibliographies containing abstracts might help this research. A review of status of a technology would be included in the directory by subject as well as by country. RSI might

initiate publication of these directories and bibliographies. The approximate annual cost would be $28,000.

2. Linkages with Existing Information Network

Information networks such as ESCAP and CSC are engaged in the dissemination of technologies in rural energy. Appointment of a research fellow to achieve linkages with these networks and collect data from each country would help quicken the rate of exchange of information (cost $30,000).

3. Newsletter

A newsletter containing information on new technologies, case studies of successes and failures, status of a new technology compared to existing ones, and other developments relating to biogas may be published. RSI might initiate the action through an editorial board. The board might consist of at least one member from each participating country and RSI. The chairman of the board would be stationed at RSI. Members of the board would collect information from their respective countries and communicate to the chairman. The newsletter might be released in the calendar months of January and July. The approximate annual cost involved in processing and printing (including mailing cost) for 1,000 copies is US$23,000.

4. Study Tours Including Exchange Scholar(s)

This mechanism would involve two modes:

a. Study tours by researchers in the research sites of other countries.

b. Practical demonstrations of a new technique by experts in other countries.

Study tours for a period of four weeks would help information sharing and make comparisons in the quickest possible manner. Exchange of scholars between countries will help sharing experience and information. The approximate cost of study tours for two researchers from each participating country would be $38,440; the cost for exchange scholars would be $28,800.

5. In-Country Training Workshops

Training workshops would be organized in each participating country to develop local expertise; two to three experts would impart training to 20 to 30 local technicians in the new technology. The training period would be four weeks. The local expenditure would be borne by the host country and the travel cost, including per diem of experts, by external aid-giving agencies. The approximate cost of two resource persons for each participating country would be $38,440.

ESTIMATED BUDGET
(For three-year activity period)

	Host Institution	External
1. Abstracted Directory and Bibliography		
a. Research fellow to RSI to review literature, 12 person-months @ $1,500	-	$18,000
b. Printing and reproduction	-	10,000
2. Linkages with Existing Information Network (research fellow)		
12 person-months to collect existing data from each country (several trips spread over 3 years)	-	24,000
Research coordination	-	13,200
3. Newsletter		
a. Editorial and secretarial services	$8,000	10,000
b. Printing and reproduction (4 issues per year for 3 years)	-	5,000
4. Study Tours and Researcher Exchange		
a. 2 persons each from 8 countries: travel for 4 weeks @ $1,500 travel + $900 per diem x 16	-	38,440
b. Exchange scholars, 1 each from 8 countries, 6 weeks each @ $1,500 + $1,200	-	21,600
5. In-Country Training Workshops (2 resource persons, 30 local trainees, 4 weeks in 8 countries)		
a. Resource persons (16) @ $1,500 + $900 x 16	-	38,400
b. Trainees and local expenses	19,200	-
TOTAL:	$27,200	$178,640

TABLE 2
BIOGAS PROGRAM

PROGRAM	Year 1 July 1980 to June 1981	Year 2 July 1981 to June 1982	Year 3 July 1982 to June 1983	Year 4 July 1983 to June 1984	Year 5 July 1984 to June 1985
1. (a) Undertake optimization work in at least one plant in each country and draw up design criteria cost data and gas production rate	↔	↔	↔		
(b) Preprocessing of organic wastes other than animal wastes	↔	↔	↔		
2. (a) Identification and isolation of active methane bacteria and studies on their performances	← Preparation →	→	← Research →		
(b) Field testing				↔	↔
3. Biogas-based integrated farming system: results on recycle of byproducts, optimum land use, and development of fisheries	↔	↔	↔		
4. Development of biogas-powered machines and appliances; results on low-cost burners, appliances, lamps, storage systems, and use of internal combustion engines	↔	↔	↔		
5. Workshops	↔ Workshop →	Workshop →	Workshop →		

ACTIVITY PLAN 4

TECHNOLOGIES: FUELWOOD AND BIOMASS

RATIONALE AND SIGNIFICANCE

Shortage of fuelwood is a growing problem in all participating countries. The deficit in fuelwood supply in these countries is estimated at about 30% to 40% of total consumption presently and probably will increase in the future if not dealt with effectively now.

In addition to efforts to increase the production of fuelwood for direct burning or as charcoal, augmenting the biomass production as feedstock for other energy conversion processes seems to be a promising prospect. Suitable technology input for improving the efficiencies of existing end-use devices is also considered important for meeting the growing demand.

STATEMENT OF THE PROBLEM

Considering the present energy demand and supply situation, intensive efforts to increase the production of fuelwood and biomass will be necessary. These efforts will involve technical and economic analyses of methods of production through activities such as laboratory-based studies, pilot demonstration projects, inter-country exchange of information, and collaborative projects.

OBJECTIVES

The overall objective of this program will be to improve the supply position of the fuelwood and other biomass to meet the domestic, agricultural, and rural industrial energy demands effectively by systematic research and development efforts in all of the participating countries.

SCOPE

Although implementation of this program is meant essentially to meet the fuelwood demands of the consumers in the rural and semi-urban areas, other sectors of society pressed by fuelwood shortage such as poor and middle income groups and rural industries will stand to benefit directly or indirectly. Improved energy supplies for the rural sector should improve the socio-economic status of this sector. Multicountry efforts for exchanging information, sharing tasks, and pooling resources will achieve planned goals more efficiently than individual efforts. The eight participating countries will be Bangladesh, India, Indonesia, Nepal, the Philippines, Sri Lanka, Thailand, and the United States.

PREVIOUS PAGE BLANK

Specific timebound operational plans to utilize the marginal land and estuarine works and development of appropriate technologies for end-use devices are envisaged to achieve the objectives without affecting the social and environmental structures. Intensive efforts will be on fuelwood plantation and on biomass production through specific agriculture methods (for use as feed to biogas plants, alcohol, and solid fuel production).

IN-DEPTH STATEMENT OF THE PROBLEM

1. Although some studies on the supply-demand pattern of the consumption and utilization of fuelwood and biomass sources of energy have been done, this additional information at the database level is essential:

a. Seasonal variation in supply-demand for fuel.

b. Correlation between family income and energy consumption.

c. Utilization of different energy sources as influenced by the price levels such as kerosene consumption.

2. Each participating country has plans for developing fuelwood and biomass resources, but these efforts must be given specific inputs through inter-country collaboration. The efforts should be delineated into two specific categories: fuelwood and other biomass production.

3. Performance trials with selected plant species should be undertaken at pilot and field levels in at least two different agroclimatic conditions in all countries.

4. Studies on the economics of the production relative to other alternatives will be conducted.

5. Studies on the development of appropriate technologies for end-use devices to improve the efficiency of utilization will be a part of the overall project.

SPECIFIC QUESTIONS AND METHODOLOGIES

These specific methodological approaches and questions are identified as critically important to production and efficient utilization of fuelwood and other biomass:

1. Collection of requested database on agroclimatic, soil, and other meteorological conditions of representative locations in each country.

2. On-site identification and selection of plant species for preliminary and intensive trials with suitable experimental design.

3. Assembly of solid comparative data on performance of outstanding tropical leguminous or other kinds of trees potentially important for fuelwood and biomass.

4. Preparation of a practical guide to growing all the selected plant species in laboratory combined with field studies, covering seeds storage, germination characters, transplantation or direct seeding, inoculation with nitrogen-fixing bacteria or fungi, soil preparation, and pest control.

5. Comparative assessment of the species regarding:

a. Cropping cycle.

b. Supplementary uses, like forage and feed.

c. Method of planting (seeds, coppicing, root suckers).

d. Available energy forms, like wood and charcoal.

e. Calorific value and carbonization.

6. Collection of these data for improving the selected tree forms: past history and uses, variations and distribution, environmental requirements, evapotranspiration, nutritional requirements, and photosynthetic efficiencies.

7. On-site studies of microbes for selection of nitrogen-fixing bacteria like rhizobia and other soil fungi for inoculation wherever needed.

8. Development of most suitable methods of irrigation for each plantation, like dry-irrigation or sprinkler methods, based on locally available water resources.

9. Establishment of optimal "silvicultural practices" considering planting distances, irrigation, after care, and harvesting for each tree species investigated.

10. Socio-economic as well as environmental studies particularly on the competition for natural resources. The specific questions are:

a. What species are cost-effective?

b. What are the alternatives and how do they compare?

c. What implications will they have on the land-use pattern?

d. Economics of production and competition, periodically evaluated.

An effort was made to evaluate the level of continuing research activity in each of the participating countries based on those specific questions. For each item in the research agenda, the matrix attached (Table 3) indicates the state of the art of research in each country. For each item, ranking (a, b, or c) indicates "large," "average," or "very little" amounts of current research. A dash (-) marks absence of any research. The last column evaluates the research topic as either "core" (C) or "augmented" (A). Core and augmented projects are ranked considering whether or not the projects are already underway on a significant scale and also whether or not the research topics are perceived as crucial to inter-country collaboration. Within the "augmented" category, ranking A1 or A2 refers to "higher-priority" or "lower-priority" areas of research.

These research topics are identified as belonging to the core research program.

CORE PROGRAM

I. FUELWOOD: Land-Based and Saline-Water (Estuarine) Based Species

1. Mass selection of species

2. Study of parameters, such as,

   a. Soil conditions

   b. Agroclimatic conditions

3. Study of:

   a. Evapotranspiration

   b. Photosynthetic efficiencies

II. OTHER BIOMASS: Baseline Information

1. Seasonal variation in supply and demand.

2. Consumption and utilization.

3. Alternative uses:

   a. Sectoral distribution

   b. Substitution

4. Correlation between family income and consumption.

5. Correlation between prices of fuels and their consumption.

The topics relating to baseline information about "other biomass" clearly belong to the jurisdiction of Activity Plan 2. The core program in the present plan essentially consists of basic studies about fuelwood plantations and about design improvements for domestic stoves.

The augmented program, to be formulated after the core program is started, would initially address topics ranked A1 in the state of the art matrix.

ACTIVITY WORKPLAN

The rationale and details for the various programs envisaged for the Activity Workplan are outlined below. Expenditures budgeted for these activities are indicated on the page 39.

WORKSHOP AND SEMINARS

1. To evolve a suitable methodology for fixing criteria for mass selection of species for a set of agroclimatic conditions, an inter-country workshop is planned for the first year.

2. Workshop on standardization of laboratory studies combined with field studies on estimating growth, yield, evapotranspiration and photosynthetic efficiencies will be organized.

3. The third workshop will pertain to the biomass production (other than fuelwood) in "inland" and "estuarine" waters.

SHORT-TERM TRAINING

Short-term training programs for research fellows will be arranged at RSI or at other country institutions for training and transfer of technology in these areas:

1. Silviculture
2. Soil microbiology
3. Irrigation methodology
4. Socio-economic analyses
5. Tissue culture--technology for plant propagation
6. Bioconversion technologies

GRADUATE STUDENTS EXCHANGE

Institutions will exchange graduate students as research interns for an average of two years.

PILOT AND DEMONSTRATION PROJECT

Pilot and demonstration projects will be undertaken in these areas:

1. Fuelwood plantations involving different species.

2. Aquaculture of algae for biomass.

3. Distillation processes for fermentation of wood and other biomass.

SECRETARIAT

A coordinating office will be formed in one of the participating countries to look after the collaborative aspects and continuity of the project.

CONCEPT AND POSITION PAPERS

One concept paper will be prepared by each country at the end of each year to report the progress on and suggest changes for the project.

IN-COUNTRY RESEARCH ACTIVITIES

Research efforts over and above the collaborative research projects just outlined will be undertaken by the participating countries using national resources. Project proposals for in-country research efforts have already been prepared by some participating countries. Other countries are expected to prepare similar proposals in the near future. Budgeted expenditures planned for the in-country research activities by all of the participating countries are indicated in Table 4.

INTER-COUNTRY ACTIVITY BUDGET (3 Years Consolidated)

Activity	Host Institutions	External
1. Inter-Country Workshops (3)		
1 per year for 24 people for 7 days	$ 6,000	$48,000
2. Researcher Exchange		
2 Months for 16 people over 3 years	12,000	60,000
3 Graduate Student Exchange		
3 graduate students per year for 2 years each	23,000	100,000
4. Pilot and Demonstration Projects: 7 per year	15,000	45,000
5. Secretariat and Project Coordination Office (including newsletter)	5,000	40,000
6. Position and Concept Papers	1,800	6,000
TOTAL:	$62,800	$299,000

TABLE 3

STATUS OF RESEARCH ON TOPICS IN THE RESEARCH AGENDA

	Bangladesh	India	Indonesia	Nepal	Philippines	Sri Lanka	Thailand	USA	PRIORITY
I. FUELWOOD									
A. Land-Based									
1. Mass selection of species	a	a	a	a	a	a	a	a	C
2. Study of parameters									
a. soil	a	a	a	a	a	a	a	a	C
b. agroclimatic	a	a	a	a	a	a	a	a	C
3. Study of Evapotranspiration									
a. evapotranspiration	–	a	–	a	c	c	b	a	C
b. photosynthetic efficiency	–	a	–	–	c	c	–	a	C
4. Water Management and Irrigation	a	b	–	–	b	c	c	a	A1
5. Microbial Inoculum Studies	c	a	–	?	b	c	c	a	A1
B. Saline-Based									
1.									
2.									
3. Same as			Same as above						A2
4. above									
5.									
C. Pyrolysis Studies	–	c	c	–	c	b	c	a	A2
D. 1. Carbonization and charcoal preparation	–	a	b	b	a	c	b	c	A1
2. Bricquetting	–	b	c	–	c	c	–	c	A1
E. Improvement of Domestic Stoves (design)	c	b	b	b	b	b	c	c	C
F. Methanol Fermentation									
1. Microbial studies	–	b	–	–	c	c	c	a	A2
2. Fermentation efficiency (conditions)	–	b	–	–	c	c	c	a	A2

TABLE 3 Continued

	Bangla-desh	India	Indonesia	Nepal	Philip-pines	Sri Lanka	Thai-land	USA	PRIOR-ITY
II. OTHER BIOMASS									
A. Agricultural Waste									
1. Base-line Information									
a. supply and demand variation (seasonal)									
b. consumption and utilization									
c. alternative uses	Core - studies to be done in Activity Plan 2								C
(1) sectoral distribution									
(2) substitution									
d. correlation between family income and consumption									
e. utilization as affected by price fluctuation									
2. Carbonization		c	–	–	b	c	–	–	A2
3. Composting	c	b	–	b	c	b	b	c	A2
4. Biogas (raw material)		c	–	–	c	b	-	c	A2
5. Liquid Fuels Production	c	b	c	c	b	c	c	a	A1
a. efficient micro-organisms									
b. fermentation efficiency									
B. Production									
1. Micro-plants (Azolla, chlorella, spironella)									
a. mass culture		a	–	c	c	–	–	a	A1
b. field performance		c	–	c	c	–	–	a	A1
c. mass selection		a	–	–	c	–	–	a	A1
2. Macro-plants (water hyacinth, cassava, sugarcane, sweet potato)									
a. as biogas raw material		b	c	–	c	b	–	b	A2
b. efficient micro organisms	c	c	c	c	b	–	–	a	A2
c. fermentation parameters	c	a	c	c	b	c	–	a	A1

TABLE 4
IN-COUNTRY RESEARCH BUDGET

	Bangladesh	India	Indonesia*	Nepal*	Philippines*	Sri Lanka*	Thailand*
			(U.S. DOLLARS)				
Personnel	$30,000	$37,500	$25,000	$20,000	$35,000	$32,000	$32,000
In-Country Travel	1,500	1,250	2,500	1,000	2,500	1,500	1,500
Office Supplies	1,500	1,875	1,500	1,250	2,000	2,000	2,000
Conferences/Workshops	3,000	3,750	4,000	2,500	3,500	3,000	3,000
Printing and Publications	3,000	3,000	3,000	3,000	3,000	3,000	3,000
Materials and Equipment	24,000	31,000	27,000	22,000	26,000	25,000	25,000
Miscellaneous 5%	3,150	3,900	3,150	2,488	3,600	3,325	3,325
Contingencies 15%	9,923	12,195	9,925	7,836	11,340	10,474	10,474
TOTAL	$76,073	$94,470	$76,072	$60,074	$86,940	$80,299	$80,299

*Approximations

ACTIVITY PLAN 5

TECHNOLOGIES AND SYSTEMS: SOLAR, HYDRO, WIND, AND ENERGY MIXES

SIGNIFICANCE AND RATIONALE

Any rural development program will involve the introduction of new rural energy technologies based on various renewable resources available locally. In many countries, efforts already have been made to develop various hardware devices and systems. An active stock taking and assessment is needed to determine the status of these technological developments and to identify devices that fit the characteristics of specific rural areas--particularly considering technical viability and appropriateness.

STATEMENT OF THE PROBLEM

Although information is available on the organizations working on the development of hardware for utilization of renewable energy sources in rural areas, no serious effort has been made so far in these countries to critically evaluate the emerging technologies and to identify areas where additional research efforts are needed. In addition, there is an active need to identify appropriate technology mixes that can meet the energy requirements of diverse rural areas in these countries.

OBJECTIVES

1. Make a critical review of the technological status in the areas of interest as well as identify the gaps existing in the development efforts.

2. Identify various technology mixes relevant to the diverse rural areas and identify a few technically feasible mixes for introduction in specific locations in each country.

COMPREHENSIVE PROBLEM DELINEATION

Meeting the energy needs of rural areas will mean introducing technologies based on renewable resources such as solar energy, wind energy, and hydropower. However, these devices must be introduced in the rural areas only after they've been proved technically sound and appropriate. Individual pieces of hardware or individual efforts have occasionally been evaluated in depth, but relatively little data are available on the overall technological status as well as on comparative technical evaluation of available hardware. The appropriate technology mixes will also vary widely given the various diverse rural areas. Therefore, not only must the status of technologies be critically reviewed, but also the appropriate technology mixes must be carefully identified. Technologies introduced in the rural areas must be both appropriate and technically sound so that energy needs

are met in an efficient manner. The proposed study will not only provide relevant information on the status of available technologies but also will identify areas where additional national or inter-country efforts are needed. The proposed studies also will be very useful in examining the possibilities for technology transfer within and among the member countries.

Some of the specific questions that would be addressed during the proposed research program are:

1. Which presently available technologies are relevant for use to meet rural energy needs?

2. What is their present level of technological development?

3. What are the technologies ready for introduction in rural areas?

4. What directions should efforts at technological development take in other areas?

5. What new hardware development programs should be undertaken in member countries?

6. Based on the specific locations, what are the appropriate technologies mixes considering physical resources, energy needs and other characteristics of the rural areas?

ACTIVITY WORKPLAN (SCOPE)

Two specific inter-country research programs have been identified that will fit into the overall plans for energy for rural development.

STUDY A: CRITICAL REVIEW OF TECHNOLOGICAL STATUS

The first study is a critical review and stock-taking of technologies and systems in each of the participating countries. This critical review will assess the status of technologies and identify specific areas in which additional hardware development is required. Each country will prepare a status report with the help of the appropriate experts and institutions and finalize the report in a country workshop. Then the report will be processed through the research coordinating office and information will be disseminated to all participating countries in preparation for inter-country workshops possibly organized along technology clusters.

The technology areas that will be covered in this study are:

1. Hydropower applications in areas such as power generation (micro hydro generating up to 100 kilowatts), direct mechanical energy outputs, water pumping, and fertilizer production.

2. Wind energy applications, such as in water pumping and decentralized electricity generation.

3. Solar energy utilization:

   a. Solar cookers

   b. Solar dryers

   c. Desalination and distillation system for potable water supply

   d. Water heating for crop processing

   e. Small scale solar power generation and water pumping,

   f. Refrigeration

4. Implements for improved utilization of animal power.

5. Miscellaneous including geothermal energy.

STUDY B: TECHNOLOGY MIX

A parallel study will be undertaken for identification of appropriate technological mixes for rural development. Based on the results of this study, each country team will identify at least one mix for installation and demonstration at a chosen site. The study can be done in stages. During the first stage, a range of appropriate technology mixes will be identified and characterized. The results of this effort will be the subject of an inter-country workshop. The second stage will be the actual installation and demonstration of a specific technology mix in a specific community. Another inter-country workshop will be held to exchange experience in the second stage of this study.

During the study of the technological mixes, attention will be directed to the advantages and disadvantages of conventional rural electrification in comparison with technological mixes based on the renewable sources of energy listed previously.

OPERATING PLAN

The institutions that could be involved in undertaking the study have been identified tentatively in Table 5. The final list may change after country plans are more fully developed. Based on information available, tentative manpower estimates for the in-country components of research studies A and B are presented in Table 6. Budget estimates for in-country costs for both studies are presented in Table 7. These estimates, however, cover only the first stage of the appropriate mixes study (B) and not the cost estimates for the installation and demonstration phase of this study.

DURATION OF STUDY

Both the critical review of technological status (Study A) and the first stage of the appropriate technology mixes study are planned to be undertaken if possible within six months. On this basis, inter-country workshops at the end of the two studies would be held near the end of 1980.

OTHER AREAS OF COLLABORATION

Support for actually undertaking the research programs will require additional areas of collaboration. Specifically these three areas are necessary: (1) exchange of personnel; (2) study visits to sites using technology mixes of interest; and (3) establishment of information support through appropriate channels.

IN-COUNTRY BUDGET (3 Years Consolidated--See also Table 7)

1.	Personnel/Manpower Costs	US$458,000
2.	Travel and Transportation	50,000
3.	Intra-Country Seminars	50,000
4.	Printing and Supplies (@ 10% of (1))	45,000
	TOTAL:	$603,800

INTER-COUNTRY BUDGET (3 Years Consolidated)

	Host Institutions	External
1. Inter-Country Workshop on Status of Technology Development in Asia		
4 participants each country for 4 days	US$10,000	US$15,000
2. Inter-Country Workshop on Technology Mixes in Asia		
4 participants each country	10,000	15,000
3. Study Visits		
2 experts each country at 3 sites in year 1	-	33,000
4. Printing of Study Reports and Exchange of Information	1,000	2,000
TOTAL:	$21,000	$65,000

TABLE 5
TENTATIVE STUDY ROLES FOR PARTICIPATING COUNTRIES

Area of Responsibility	Bangladesh	India	Indonesia	Nepal	Philippines	Sri Lanka	Thailand
Overall Coordination	Planning Commission		Directorate General of Energy	NCST	CNED	BEB	NRC
Hydro Power	PDB		State Electricity Enterprise (PLN)	RECAST	NEA/NPC	CEB	NEA
Solar Energy	BCSIR/ BUET	DST BHEL JYOTI	DBPT/ITB	RECAST	UPS/CNED	National Science	National Science & Technology Research Institute
Wind Energy	BCSIR/ BUET/ AEC	NAL CSMCRI JYOTI	ITB	RECAST	CNED	CEB/Water Resources Board	NEA
Technology Mixes Study	BCSIR/ BUET	DST BHEL JYOTI	ITB/IPB	ERDG/ RECAST	CNED	CEB	NEA

TABLE 6
MANPOWER REQUIREMENTS
(expert-months)

	Bangladesh	India	Indonesia	Nepal	Philippines	Sri Lanka	Thailand
Study A: Critical Review of Technological Status	28	74	42	26	44	30	45
Study B: Technology Mixes	17	43	24	16	25	18	26

TABLE 7

COST ESTIMATES FOR IN-COUNTRY RESEARCH PROGRAMS

	Bangla-desh	India	Indo-nesia	Nepal	Philip-pines	Sri Lanka	Thai-land	Total
Study I: Critical Review of Technological Status								
Manpower	$28,000	$74,000	$42,000	$26,000	$44,000	$30,000	$45,000	$289,000
Travel*	2,500	6,250	3,750	2,500	3,750	2,500	3,750	25,000
In-Country Workshop**	3,200	4,300	3,700	3,200	3,700	3,200	3,700	25,000
Printing and Supplies***	2,800	7,400	4,200	2,600	4,400	3,000	4,500	28,900
								367,900
Study II: Technology Mixes								
Manpower	17,000	43,000	24,000	16,000	25,000	18,000	26,000	169,000
Travel*	2,500	6,250	3,750	2,500	3,750	2,500	3,750	25,000
In-Country Workshop**	3,200	4,300	3,700	3,200	3,700	3,200	3,700	25,000
Printing and Supplies***	1,700	4,300	2,400	1,600	2,500	1,800	2,600	16,900
								235,900
TOTAL	$60,900	$149,800	$87,500	$57,600	$90,800	$64,200	$93,000	$603,800

NOTE: Figures (in US dollars) are in expert-months and the charges have been taken at US$1,000 per expert-month which includes supporting staff and related costs.

*On an average, each trip is expected to cost US$250. The number of trips for each country is based on the level of activity in each technological area.

**The expenditures are based on approximately 30 participants in each workshop lasting 4 to 5 days. The total expenses, travel and per diem, have been estimated at US$100 to $200 per person.

***Printing and other supplies are calculated at 10% of the manpower cost.

ACTIVITY PLAN 6
VIABILITY ASSESSMENT: TECHNICAL, ECONOMIC, AND SOCIAL

PROBLEM STATEMENT

As techniques for evaluation and selection of rural energy technologies are developed, a comprehensive methodology must be determined and evolved. That methodology ultimately will lead to the selection of technologies which could be applied in the rural sector to facilitate rural development.

Four methodologies will be examined for their applicability to assessing rural energy technologies:

1. "Conventional" benefit-cost analysis.

2. Domestic resource cost (DRC) analysis.

3. Criterion framework and indicators for comparing and evaluating energy technologies.

4. System optimization for rural energy technology mixes, including decentralized as compared to centralized system.

METHODOLOGIES

1. Develop methodologies individually or institutionally in each country for evaluation and selection of rural energy technologies.

2. Apply methodologies developed in (1) to specific energy projects as case study examples.

3. Convene inter-country methodology workshops to review and refine techniques used in various countries.

4. Evaluate applicability of methodologies through ex-post appraisal of continuing energy projects and new energy technologies.

5. Convene in-country training workshop to educate researchers and planners about use of methodologies.

MODES

1. In-Country Research

Individually or institutionally identify and develop analytical methodologies and apply them to energy projects selected as case study examples for three years.

2. Convene Inter-Country Workshop I (Year I)

a. Objective: To review, analyze, and refine methodologies adopted by each country and evaluate applicability for policymakers and planners.

b. Location: Asia

c. Duration: One week

d. Participants: Two per country and one or two from RSI

3. Researchers Exchange

Provide three to four inter-country exchange visits per year for for three years.

4. Semiannual Newsletter for three years. For Activity Plans 1, 6, 7, and 8.

5. Yearly Publication of Analytical Studies for Three Years.

6. Inter-Country Workshop II (Year 2)

a. Objective: To finalize methodologies; to plan training workshops; to implement methodologies as planning and policy tools.

b. Location: Asia

c. Duration: One week

d. Participants: Two per country and one or two from RSI

7. In-Country Training Workshops (Year 3)

a. Objective: To educate researchers, planners, and others in use of methodologies as tools for evaluating rural energy technologies.

b. Location: Each country

c. Duration: One week

d. Participants: About 30 per country

BUDGET (3 Years Consolidated)

	Host Institutions	External
1. Inter-Country Workshop I		
a. In Asia 14 participants for one week = 3.5 person-months x $1,000 per participant per diem and travel	-	$14,000
b. Secretariat staff and local expenses	$1,500	
c. Resource persons (2) $1,500 travel + $245 per diem = $1,745 x 2	-	3,490
d. Publication of proceedings	1,500	3,500
2. Inter-Country Workshop II (same as above)	3,000	20,990
3. Newsletter (2 per year x 3 years)		
a. Editorial and secretarial expenses	-	18,000
b. Printing and reproduction	-	5,000
4. Researcher Exchange (12) One week inter-country travel 4 exchange researchers per year for 3 years		
a. $1,500 travel per person	-	18,000
b. $35 per diem per person	2,940	-
c. $200 honorarium per person	-	2,400
5. In-Country Workshops One week in 7 countries 30 persons		
a. Travel: $10 per person x 30 x 7	2,100	-
b. Per diem: $10 x 30 x 7	2,100	12,600
c. In-Country honoraria: $15 per day for 3 experts in 7 countries	-	2,205
6. Analytical Studies		
a. Printing and reproduction	-	10,000
b. Other expenses	-	10,000
TOTAL:	$13,140	$120,185

TIMETABLE

	Year 0		Year 1		Year 2		Year 3	
1. In-Country Research		X	X		X	X	X	X
2. Inter-Country Workshops				X				
3. Publish Workshop Proceedings								X
4. Newsletter								
5. Inter-Country Researcher Exchange								
6. In-Country Training Workshops								X
7. Publication of Analytical Studies			X		X		X	

ACTIVITY PLAN 7

VILLAGE SOCIAL STRUCTURE AND THE ROLE OF POLITICAL AND OTHER INSTITUTIONS IN PROMOTING INTRODUCTION OF TECHNOLOGIES

PROBLEM STATEMENT

In addition to technical or economic considerations, success or failure in the adoption of an energy technology mix interacts with various social and organizational parameters. Therefore, local, regional, or national organizations that play a part in introducing energy technologies and in rural development must understand the social structure of the villages involved. Likewise, these organizations themselves must be examined for characteristics and capabilities suitable to the role of promoting technologies and to other rural development tasks.

METHODOLOGIES

1. Make in-country typological studies of village social structure and develop guidelines for characterizing village social structure.

2. Develop case studies examining the role and efficiency of local, regional, and national organizations and institutions in promoting energy technologies and undertaking other rural development tasks.

3. Convene inter-country workshops to review and compare results, to refine methodologies, and to make recommendations for standardized methodologies that facilitate inter-country comparisons.

4. Train researchers, planners, and others in-country to implement technology adoption and other rural development programs.

MODES

1. In-Country Research

a. Individually or institutionally identify and develop analytical methodologies and apply them to examining villages selected as case study examples.

b. Individually or institutionally identify and develop analytical methodologies and apply them to examining local, regional, and national organizations and institutions selected as case study examples.

2. Inter-Country Workshop I (Year 1)

Objective: To review, analyze, and refine methodologies adopted by each country; to evaluate applicability for policymakers and planners.

Location: Asia

Duration: One week

Participants: Two per country and one or two from RSI

3. Researchers Exchange

To provide three or four inter-country exchange visits per year for three years.

4. Semiannual newsletter for three years.

For Activity Plans 1, 6, 7, and 8.

5. Yearly publication of analytical studies for three years.

6. Inter-Country Workshop II (Year 2)

Objective: To finalize methodologies; to plan training workshops; and to implement methodologies as planning and policy tools.

Location: Asia

Duration: One week

Participants: Two per country and one or two from RSI

7. In-Country Training Workshop (Year 3)

Objectives: To educate researchers, planners, and others in use of methodologies as tool for evaluating rural energy technologies.

Location: Each country

Duration: One week

Participants: About 30 per country

BUDGET (3 Years Consolidated)

	Host Institutions	External
1. Inter-Country Workshop I		
a. In Asia 14 participants for one week = 3.5 person-months X $1,000 per participant (per diem and travel)	-	$14,000
b. Secretariat staff and local expenses	$1,500	
c. Resource persons (2) $1,500 travel + $245 per diem = $1,745 X 2	-	3,490
d. Publication of proceedings	1,500	3,500
2. Inter-Country Workshop II (same as above)	3,000	20,990
3. Newsletter (2 per year X 3 years)		
a. Editorial and secretarial expenses	-	18,000
b. Printing and reproduction	-	5,000
4. Researcher Exchange (12) One week inter-country travel 4 exchange researchers per year for 3 years		
a. $1,500 travel per person	-	18,000
b. $35 per diem per person	2,940	-
c. $200 honorarium per person	-	2,400
5. In-Country Workshops One week in 7 countries 30 persons		
a. Travel: $10 per person X 30 X 7	2,100	-
b. Per diem: $10 X 30 X 7	2,100	12,600
c. In-Country honoraria: $15 per day for 3 experts in 7 countries	-	2,205
6. Analytical Studies		
a. Printing and reproduction	-	10,000
b. Other expenses	-	10,000
TOTAL:	$13,140	$120,185

TIMETABLE

	Year 0		Year 1		Year 2		Year 3	
1. In-Country Research								
2. Inter-Country Workshops				X		X		
3. Publish Workshop Proceedings					X		X	
4. Newsletter			X	X	X	X	X	X
5. Inter-Country Researcher Exchange								
6. In-Country Training Workshops								X
7. Publication of Analytical Studies				X		X		X

ACTIVITY PLAN 8

STRATEGIES FOR LARGE SCALE INTRODUCTION AND TRANSFER OF ENERGY TECHNOLOGIES FOR RURAL DEVELOPMENT

PROBLEM STATEMENT

Pilot and demonstration projects for introducing new and renewable energy technologies in the rural areas are essential preconditions to learning how viable these technologies are in the rural environment, considering social and organizational aspects as well as pricing and subsidy issues. These projects, however, would make only a minor contribution towards meeting the total energy needs of rural communities. Major public and private programs and appropriate strategies would have to be developed for financing energy facilities; for social organizational set-up; for equitable distribution; and for proper pricing (including subsidies for deserving groups). Strategies for the diffusion of proven systems into new areas should be evolved for the large-scale introduction of these technologies following the pilot and demonstration project phase.

Some of the new and renewable technologies, such as solar photovoltaic, solar thermal, wind, and biomass are appropriate for use in rural areas of developing countries. Introduction of these technologies is often constrained, however, for two reasons: (1) these technologies often are unavailable domestically; and (2) the developing countries have a weak bargaining position with the large multinational corporations, who often monopolize these technologies. The role technology transfer plays in large-scale introduction of these technologies for rural development needs to be examined considering:

1. The appropriateness of both sophisticated technologies and simple technologies to the rural areas under specific situations.

2. Strategies for technology transfer related to hardware, software, and system design capabilities.

3. Strategies for bilateral transfer of technologies developed by public institutions and private firms with government funding.

4. Modalities of technology transfer within the developing countries.

METHODOLOGIES

1. Monitor and ex-post evaluate pilot and demonstration projects for rural energy supply to:

a. Validate the choice of technologies for future large scale applications.

b. Delineate areas where technology modification or development is needed either to reduce the cost or to increase the suitability and reliability of the technology mix.

c. Identify resource, manpower, and material requirements for large-scale production of hardware components, as well as infrastructure, skills, and manpower necessary for their introduction and continued operation in the rural areas.

d. Study the organizational and social issues and any regional variations needed in organizational forms for successful introduction of such technologies.

e. Study the fiscal policies, including pricing and subsidy issues and credit for the successful introduction of energy technologies.

f. Study the linkages necessary with other rural development activities such as irrigation, rural industry, health, education, water supply, sanitation, and cultural activities.

2. Develop case studies.

3. Study technological requirements for rural energy supply systems and evaluate the role of simple and sophisticated technology for rural areas to identify technologies and their sources and to study the available agencies of technology transfer, absorption, and development.

BASE DATA REQUIREMENTS

1. Quantification of village energy requirements for specific family economic and social activities.

2. Material, manpower, resource, and infrastructure requirements for introducing new energy technologies on a large scale.

3. Directory of world-wide technology suppliers relevant to rural energy systems.

MODES

1. In-Country Research A

Individually or institutionally monitor and evaluate pilot and demonstration projects for rural energy supplies and develop case studies over three years.

2. In-Country Research B

Individually or institutionally study the technological requirements for rural energy projects; identify technologies to be imported; and study agencies for technology transfer; three years.

3. Inter-Country Workshop I (Year 2)

Objective: To review and compare the results of pilot and demonstration projects; to study the role of technology and social and organizational aspects in the success or failure of the project.

Location: Asia

Duration: One week

Participants: Three per country (including one from government) and one or two from RSI

4. Inter-Country Workshop II (Year 2)

Objective: To study the transfer, absorption, and development of energy technologies for rural development.

Location: Asia

Duration: One week

Participants: Two from each country and one or two from RSI

5. Foreign Training and Study Tours.

To provide three or four training study tours for country in the second two years.

6. Publication of case studies, semi-annual for three years.

7. Semi-annual Newsletter for three years.

8. In-Country Training Program (Year 3)

Objective: To educate planners and governmental officers in project identification, formulation, appraisal, and implementation for rural energy systems.

Location: Each country

Duration: Two weeks

Participants: About 30 per country

BUDGET (3 Years Consolidated)

			Host Institutions	External
1.	Inter-Country Workshop I (Excluding cost of RSI participants) 21 participants			
	a. Air travel and 7 days per diem		$3,000	$13,800
	b. Publication of proceedings			1,000
2.	Inter-Country Workshop II (Excluding cost of RSI participants) 14 participants			
	a. Air travel and 7 days per diem		2,000	9,000
	b. Publication of proceedings			1,000
3.	Study Tours and Foreign Training 2 persons per country (14) air fare $2,000 + 30 days per diem x 40 @ 1,000		9,800	35,000
4.	Publication of Case Studies 2 publications per year			20,000
5.	Newsletter $1,000 per year			3,000
6.	In-Country Workshops 7 countries in Year 3			
	$10 per day per person x 30 x 14 days	= $4,200	8,400	21,000
	30 persons x $25 travel	750		5,250
	In-Country Honoraria $15 per day x 3 people x 14 days	= 630		4,410
		TOTAL:	$23,200	$113,460

TIMETABLE

	Year 0	Year 1	Year 2	Year 3
1. In-Country Research A				
2. In-Country Research B				
3. Inter-Country Workshops		X	X	
4. Study Tours and Foreign Training			X X	
5. Publication of Case Studies		X X	X X	X X
6. Newsletter		X X	X X	X X
7. In-Country Training Programs				X

PART III

OPERATIONAL PLAN

MODES OF COLLABORATION

Several modes of collaboration are envisaged in the inter-country activity plans. One will be inter-country workshops on methodologies and technologies. Early workshops of the eight activity groups will incorporate state of the art reviews and development of methodologies relevant to the problem area. Subsequent workshops will refine or evaluate continuing work on the development of new methodologies and technologies, and a final series of workshops will likely concentrate on disseminating that information to a broader group of researchers as well as end users at an appropriate development stage. In-country workshops will supplement the inter-country workshops, either for analytical, design, or training purposes.

Research conducted by host institution researchers in cooperation with exchange scholars provides the underlying collaborative mode for interdisciplinary contributions to the program objective. Exchange of researchers engaged in cooperative tasks on specific problem components will occur before as well as between workshops. Included will be specialists seconded for particular tasks as well as research fellows engaged in interdisciplinary problem-oriented studies. The length of the researchers' stay will vary according to breadth of task. Shorter study tours would consist of teams representing several countries.

Plans for exchange of information among countries and within countries include setting up information clearinghouses in each country with a central clearinghouse located in one of the participating Asian institutions. The clearinghouse information system will also support communication among different specialized fields in energy and rural development.

Various cooperative research outputs have been planned, including published reports, state of the art review, design or construction manuals based on successfully developed hardware, case studies, and appropriate methodologies evolved for use by those engaged in planning, implementing, or evaluating rural energy policies, programs, and projects. The training function finds expression in several modes, including inter- and in-country workshops, study tours, and production of manuals for in-country training.

MATRIX OF ACTIVITY WORKPLANS

Figure 2 depicts the modes of collaboration as events in the activities workplans over a three-year period starting in April 1980. In the entry for the Activity 3 workplan (Biogas), study tours and an exchange of researchers would be organized over the three-year period. The research output symbol (Δ) in the second six-month period refers to a

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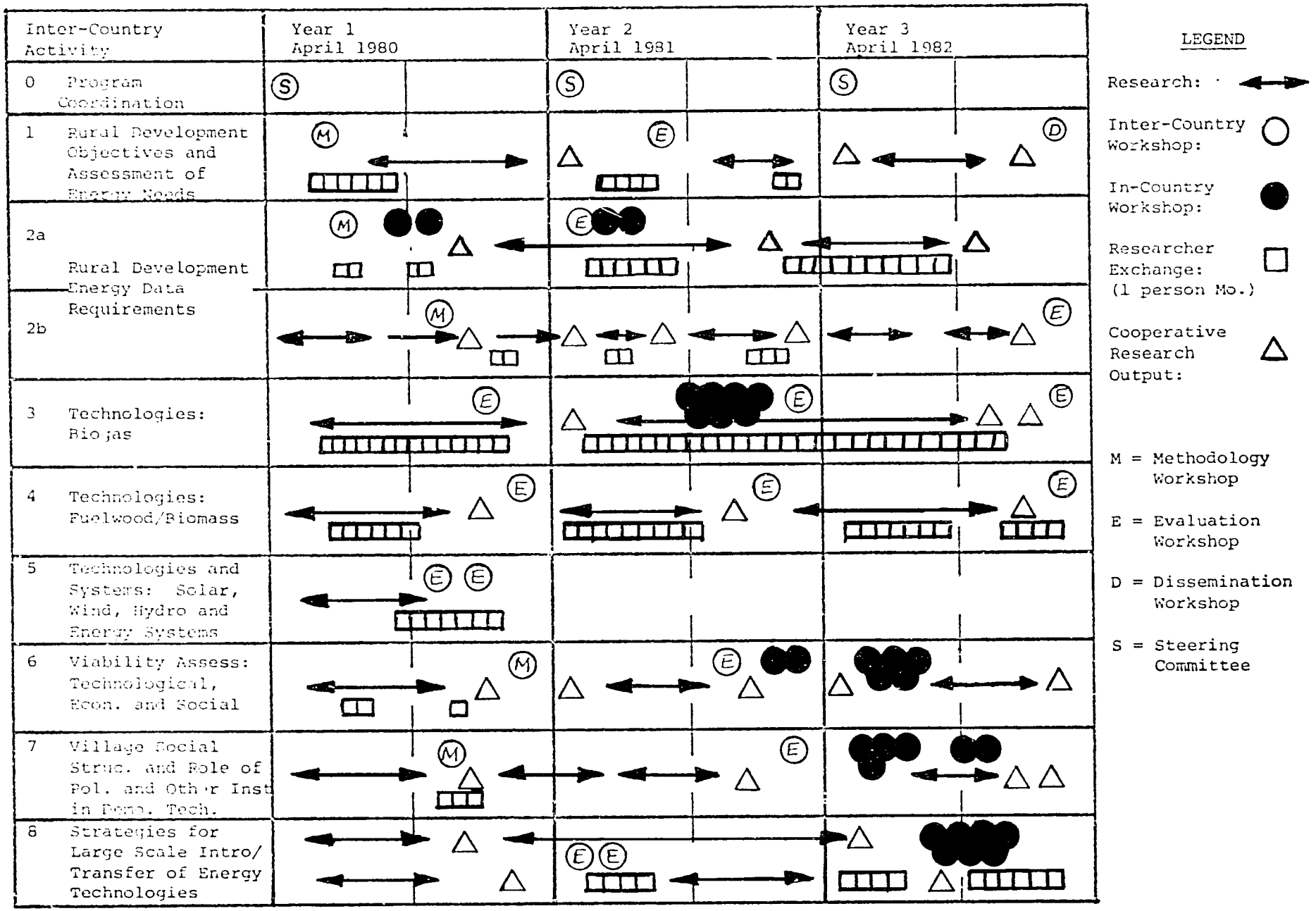
Figure 2 Full ERD Program Activity Schedule



plant that will embody the optimization work listed as a major research objective. Three planned inter-country workshops, one at the end of each year, would compare findings on design criteria as well as data on cost and gas production efficiency. By the end of the third year an in-country workshop would be convened in each country to disseminate construction techniques for plants determined most suitable considering cost, durability, gas production, efficiency, and mix of input materials.

The workplan of Activity 5 (Technologies and Systems) has not been formulated beyond the first nine-month period since it depends on each country's own critical review of the state of the art. Additional research activities will be planned at an inter-country workshop held at the end of that period.

The matrix in Figure 2 provides a basis for reorganizing events in the workplans according to resource constraints. It also suggests the possible economic and collaborative advantages of holding at least some of the workshops at the same time and place.

CORE PROGRAM: INTEGRATION AND SCHEDULING OF ACTIVITIES

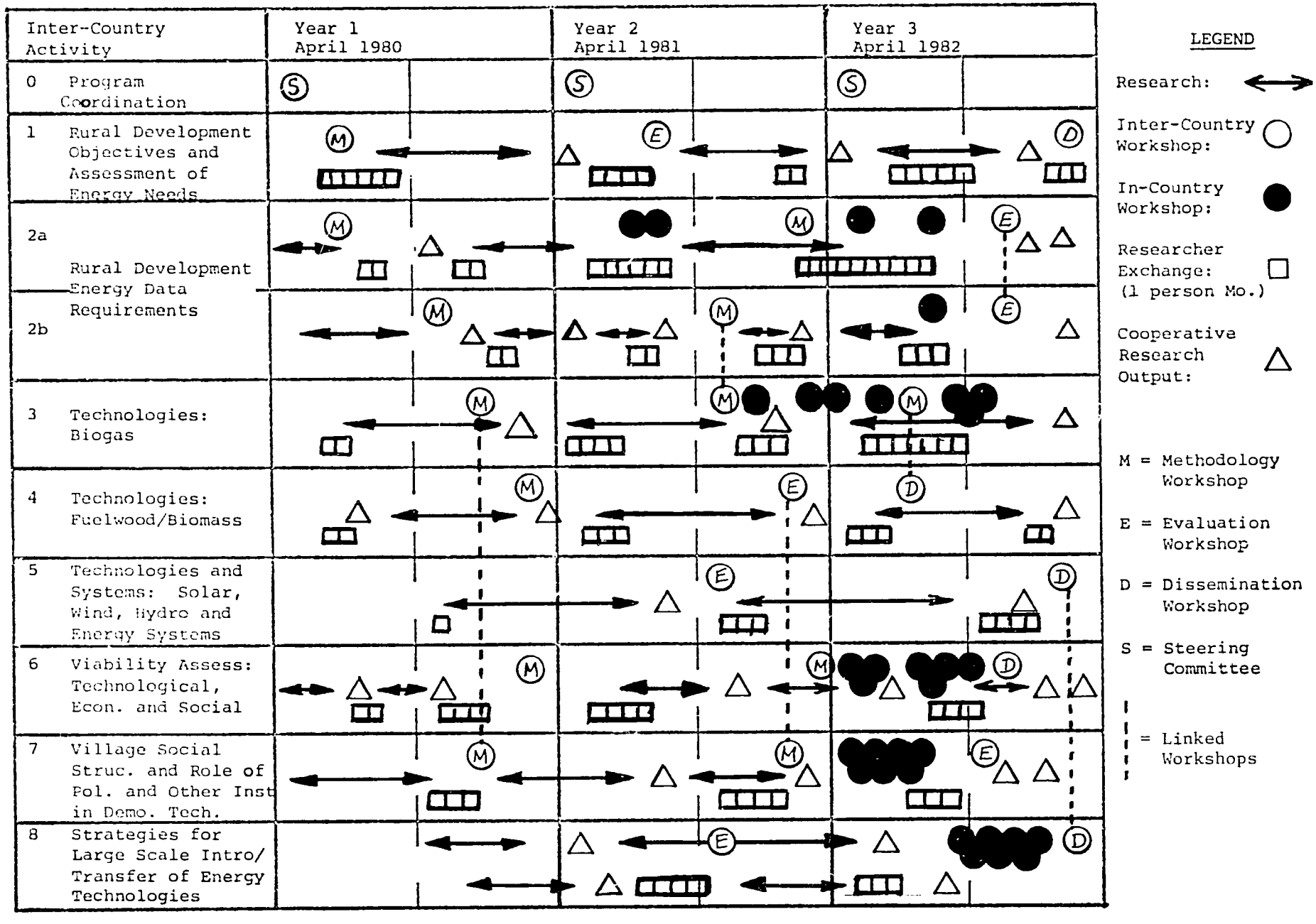
The Core Program is structured as a minimum set of integrated activities and events required to assess rural energy needs, resources, and gaps, and thereby to clarify understanding of policy and technology alternatives for meeting rural development objectives.

In constructing the Core Program, events specified in each activity workplan were assessed considering the modes and number of inter-country events supported by the energy and rural development grant to the Resource Systems Institute from the Agency for International Development. Particular attention was given to the minimum number of proposed exchanges of researchers, workshops, and training programs necessary to fulfill the activity objectives. To achieve essential linkages and communication among policy, technology, and assessment activities, initial balance and subsequent progression of collaborative events among the activities were assessed. The Core Program Schedule (Figure 3) integrates a minimum set of inter-country events and activities necessary to achieve the stated objectives.

Specifically, each researcher exchange indicated in Figure 3 represents one person-month. The total number of person-months shown for the eight activities from April 1980 to April 1981 equals the estimated months (at unit costs) available for this purpose in the RSI/AID grant.

The eight workshops to be supported by RSI in Year 1 indicated in Figure 3 represent a reduction of two from the total proposed in the full activity workplans, and an average 15 percent reduction in numbers of participants. Training components and publication support are in balance with the projected research and workshop activities.

Figure 3 ERD Core Program Schedule



Vertical dotted lines in Figure 3 represent inter-activity workshops provided in the Core Program. For example, these include:

Year 1 Activities 3 (biogas) and 7 (village organization)

Year 2 Activities 2B (techno-economic parameters) and 3 (biogas)
Activities 4 (fuelwood) and 7 (village organization)

Year 3 Activities 2A (policy analysis) and 2B (felt needs and techno-economic analysis)
Activities 3 (biogas) and 4 (fuelwood)
Activities 5 (selected technologies) and 8 (technology transfer)

The workshop agreed that a principal researcher located in one of the participating Asian institutions should serve in a coordinating role for the development of research activities. It was suggested that the Research Coordinating Office recommended in Activity Plan 1 might ultimately serve as the center for those activities. At first, a researcher with interest in Activity Plan 1 should actively liaise with coordinators of each of the other research activities.

ESTIMATED BUDGETS FOR IN-COUNTRY AND INTER-COUNTRY ACTIVITIES

Estimated budgets for in-country research activities developed by each Inter-Country Activity Planning Group are summarized in Table 8. The in-country budgets reflect different stages of completeness in preparatory budgeting. The budget for Activity 4, for example, is based closely on itemized estimates for this research component. Budgets for other activities require substantial reworking by the participating institutions. This review will include consultation with institutions not represented in Chiang Mai but who might join the program. Because of budget review requirements, few participating institutes could make resource commitments at the time of the workshop. Therefore, in-country budgets are order-of-magnitude estimates and are currently under revision. The total in-country research budget for all activity plans on this provisional basis is $4,152,565.

Estimated budgets for inter-country activities, on the other hand, were worked out in closer detail by each planning group and are included in the respective Activity Plans. Inter-country budgets are summarized in Table 9 with a breakdown of host institution and external funding shares. The inter-country research budget arrays cost estimates for key modes of collaboration in each activity workplan and sums these costs for operationalizing the modes across the entire set of workplans. The inter-country research budget for the three-year Energy for Rural Development Research Program is estimated at $1,486,050. A contingency factor of 15% has been added to all inter-country activity budgets raising the total figure to $1,708,957. Although detailed revisions and corrections are being made, these inter-country budgets are reasonably close estimates of required resources. Clearly, significant oportunities exist for both national and international funding agencies to participate in this unique international research endeavor.

TABLE 8

IN-COUNTRY RESEARCH BUDGET

COUNTRY \ ACTIVITY PLAN	1	2A/B	3	4	5	6	7	8	TOTAL
• Bangladesh	$45,000	$60,376	$224,000	$76,073	$60,900	$30,000	$30,000	$35,000	$561,349
• India	65,000	75,470	300,000	94,470	149,800	45,000	45,000	50,000	820,740
• Indonesia	65,000	45,282	161,000	76,072	87,500	45,000	45,000	50,000	514,854
• Nepal	45,000	45,282	225,000	60,072	57,600	30,000	30,000	35,000	527,956
• Philippines	65,000	60,376	125,000	86,940	90,800	45,000	45,000	50,000	568,116
• Sri Lanka	45,000	75,470	127,000	80,299	64,200	30,000	30,000	35,000	486,969
• Thailand	65,000	45,282	185,000	80,299	93,000	45,000	45,000	50,000	608,581
TOTALS	$395,000	$407,538	$1,347,000	$554,227	$603,800	$270,000	$270,000	$305,000	$4,152,565

NOTE: Figures are given in U.S. dollars.

TABLE 9

INTER-COUNTRY RESEARCH BUDGET

MODES \ ACTIVITY PLAN	1	2A	2B	3	4	5	6	7	8	Total Host	Total External	Grand Total
• Inter-Country Workshops	$57,000 10,000	$41,960 3,000	$34,930 3,000	- -	$48,000 6,000	$30,000 20,000	$34,980 3,000	$34,980 3,000	$22,860 5,000	- $53,000	$304,700 -	$357,700
• In-Country Workshops	- -	17,600	- -	$19,200 -	- -	- -	14,805 4,200	14,805 4,200	30,660 8,400	- 53,600	60,270 -	113,870
• Researcher Exchange	20,000 10,000	59,390 14,590	20,400 5,880	102,000 -	60,000 12,000	- -	20,400 2,940	20,400 2,940	- -	- 48,350	302,590 -	350,940
• Study Visits	- -	- -	- -	38,440 -	- -	33,000 -	- -	- -	35,000 9,800	- 9,800	106,440 -	116,240
• Student Exchange	- -	- -	- -	- -	100,000 23,000	- -	- -	- -	- -	- 23,000	100,000 -	123,000
• Demonstrations Projects	- -	- -	- -	- -	45,000 15,000	- -	- -	- -	- -	- 15,000	45,000 -	60,000
• Research Coordination	51,800 13,000	- -	- -	13,200 -	40,000 5,000	- -	- -	- -	- -	- 18,000	105,000 -	123,000
• Information Exchange	25,000 -	- -	- -	15,000 8,000	- -	- -	23,000 -	23,000 -	3,000 -	- 8,000	89,000 -	97,000
• Publications	- -	17,000 3,000	18,500 3,000	10,000 -	6,000 1,800	2,000 1,000	27,000 3,000	27,000 3,000	22,000 -	- 14,800	129,500 -	144,300
TOTALS	153,800 33,000	118,350 38,190	73,880 11,880	178,640 27,200	299,000 62,800	65,000 21,000	120,185 13,140	120,185 13,140	113,460 23,200	- $243,550	$1,242,500 -	
TOTALS	$186,800	$156,540	$85,760	$205,840	$361,800	$86,000	$133,325	$133,325	$136,660			$1,486,050

Note: The first figure in each entry is external funding and the second figure is host institution funding. (In the first entry, $57,000 = external funding; $10,000 = host institution funding.)

ERD INFORMATION EXCHANGE AND CLEARINGHOUSE SYSTEM

INTRODUCTION

International collaborative research envisioned in the Energy for Rural Development (ERD) Program requires close and continuous communication among the participating organizations. Successful collaborative research relies on exchanging not only ideas and insights but also concrete information, such as bibliographies, publications, working papers, statistical data, graphics, and realia (models, components, and mock-ups). In particular, institutions participating in the creation of the ERD Program have recognized the important role that several information exchange modes can play in their cooperative efforts. An opinion survey administered to the participants in the May 1979 ERD Planning Workshop showed that most of the fifteen modes suggested for cooperation and information exchange were considered potentially valuable. Four specific information exchange modes were considered specially important: (1) document exchange, especially of preliminary reports and working notes, (2) bibliography and directory exchange, (3) technical inquiry services, and (4) newsletters and reports of research in progress. Several members of the Chiang Mai Workshop contributed to the preparation of an action plan promoting these specific information-sharing modes. The plan presented here proposes the establishment of an information exchange network hereafter referred to as the Energy for Rural Development Information Network or ERDINET to support the emerging ERD Program.

OBJECTIVES

The goal of this plan is to develop a network of clearinghouses (one central, seven in-country, and RSI) that will interact to provide the four information-sharing services named above. It is expected that this network, ERDINET, would permit greatly increased quantity and quality (appropriateness, timeliness) of information flow both among the participating ERD institutions and with relevant organizations in other parts of the world. ERDINET would require a far smaller financial and manpower cost than would be entailed if all of the participating organizations were to pursue such communications activities independently. The ultimate benefit would be greater scientific and technical productivity for all of the institutions and individuals involved through reduced duplication of effort and more systematic use of existing knowledge.

RATIONALE

Realizing the important role active information sharing must play in the success of the ERD Program and the limitations of available services and systems, the Chiang Mai Workshop incorporated specific information exchange strategies into each of the Inter-Country Activity Plans. For example, Activity Plan 1 calls for the establishment of a modest information clearinghouse and communications infrastructure to support in-country and inter-country research on rural needs assessment. Activity Plans 2 and 3 provide for an efficient transfer of documents and data among members of their

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respective inter-country research teams. Five Activity Plans (1, 4, 6, 7, and 8) specifically budget for special topic newsletters. Activity Plan 3 outlines a mechanism for production of abstracted bibliographies and directories on biogas as a part of its cooperative effort. The total budgetary requirement for the information exchange components of the Activity Plans amount to $97,000. An additional $123,000 has been budgeted in the Activity Plans for research coordination; a substantial portion of this requirement is designated for management of information flow. (See Inter-Country Activity Budgets, p. 71.)

The plan outlined here provides a mechanism for the integrated management of specific information exchange modes, currently budgeted separately in each Activity Plan. If funding can be secured for the integrated ERDINET package, a portion of each Activity Plan budget could be used for augmenting the projected research programs.

ERDINET ORGANIZATIONAL STRATEGY

Although information relevant to the ERD Program will continue to flow through existing channels (person-to-person contacts, journals, and other communications), the proposed network (ERDINET) is designed specifically to support the following information exchange needs of the ERD Program:

1. Individualized servicing of information needs of participants in the ERD Program through aggressive acquisition and dissemination of information.

2. Systematic access to technical information from the seven participating countries in the ERD Program that otherwise might not come to their attention.

3. Efficient access to the services of existing regional and international information sources (such as RERIC, RCTT, and SERI).

4. Appropriate matching of information needs of inter-country research teams with available resources, and equitable routing of documents and data among institutions and individuals participating in international team research in the ERD Program.

5. Inter-country communications for transmitting documents rapidly and at low-cost (bulk air or surface parcel post vs. high cost first-class airmail or hand-carriage).

Structurally, the network would consist of five principal types of organizational units:

- Participating Institutions and Individuals in the ERD Program

- Seven Country Clearinghouses-- one in each Asian participating country in the ERD Program

- The East-West Resource Systems Institute (RSI)

- A Central Clearinghouse located in one of the seven Asian participating countries in the ERD Program

- External Information Sources and Networks located outside the ERD Program network

The roles of the five organizational units or modes of ERDINET are briefly described below:

The participating Institutions and Individuals would be the principal information-users of the system, in order to support individual, institutional, or specific Activity Research Plan functions. These institutions and individuals would also provide information to ERDINET through their Country Clearinghouses, either actively (without prior solicitation) or on request from the Country Clearinghouses.

The Country Clearinghouses would serve as a central source of ERD information in each country, allowing researchers and institutions to query one place for information rather than a wide variety of institutions or individuals in a given country. The Country Clearinghouses would receive, process, and transmit documents and data through the network according to defined procedures. Bibliographic and directory information would be solicited and collected from the participating institutions and individuals, checked for correct citation procedures, and transferred to the Central Clearinghouse for further processing. Each Country Clearinghouse would also maintain directories, lists of meetings and information to help in responding to in-country or external queries about ERD activities in that country. These Clearinghouses would also serve as in-country coordinators, supplying technical information originating from external sources. They would also solicit, receive, edit, and transmit to the Central Clearinghouse articles and progress reports for publication in the ERDINET Newsletter.

The East-West Resource Systems Institute (RSI) would serve as an information link to American and European computerized databases and make available its own resource materials collection and information services. RSI would also be responsible for computerized publication and distribution of the bibliographic and directory information provided by other ERDINET organizational units.

The Central Clearinghouse would specialize in inter-country information coordination and in linking ERDINET with external information sources and networks. Thus, by maintaining directories and files, it could efficiently direct queries for information (received from institutions or individuals through their Country Clearinghouses) to other ERDINET Country Clearinghouses, or to the appropriate external information sources or networks (VITA, RERIC, RCTT, ITDG, and others). Responses to queries could also be distributed to other ERDINET units, or be recorded in the ERDINET Newsletter, and thus become available to persons other than the initial

inquirers. Information generated by individuals and institutions in the ERD program could also be disseminated by the ERDINET Central Clearinghouse to parties outside the seven country program if this were agreeable to the participating institutions and individuals. All inter-country document exchanges would be routed through the Central Clearinghouse for non-selective dissemination to Country Clearinghouses. Bibliographic and directory information received from the Country Clearinghouses would be keyworded, abstracted, formatted, and sent to RSI for computerized processing, printing, and distribution. All technical inquiries among countries and with external information sources would be managed through the Central Clearinghouse. The Central Clearinghouse would also edit, publish, and bulk air post the ERDINET Newsletter to the Country Clearinghouses for in-country distribution.

External Information Sources and Networks would interact with ERDINET through the Central Clearinghouse. Information requests from participating units in ERDINET would be channeled through the Central Clearinghouse to the External Information Sources and Networks and, when appropriate, information and data generated by ERDINET units would be disseminated to external information sources and networks.

ERDINET INFORMATION EXCHANGE MODES

The ERDINET information exchange will be accomplished through four principal modes: (1) document exchange; (2) production and distribution of bibliographies and directories; (3) technical inquiry services; and (4) production and distribution of a newsletter. Further details about these information exchange activities are illustrated in Figures 4-7. These illustrations are simplified and do not attempt to provide all possible information flows among all the participating countries, institutions, and individuals in ERDINET.

ACTIVITY PLAN (YEAR 1)

A. Identify institutional locations for seven Country Clearinghouses and a Central Clearinghouse. Sites for Clearinghouses should be in close proximity to several high quality science and technology information units such as university and governmental libraries or document centers.

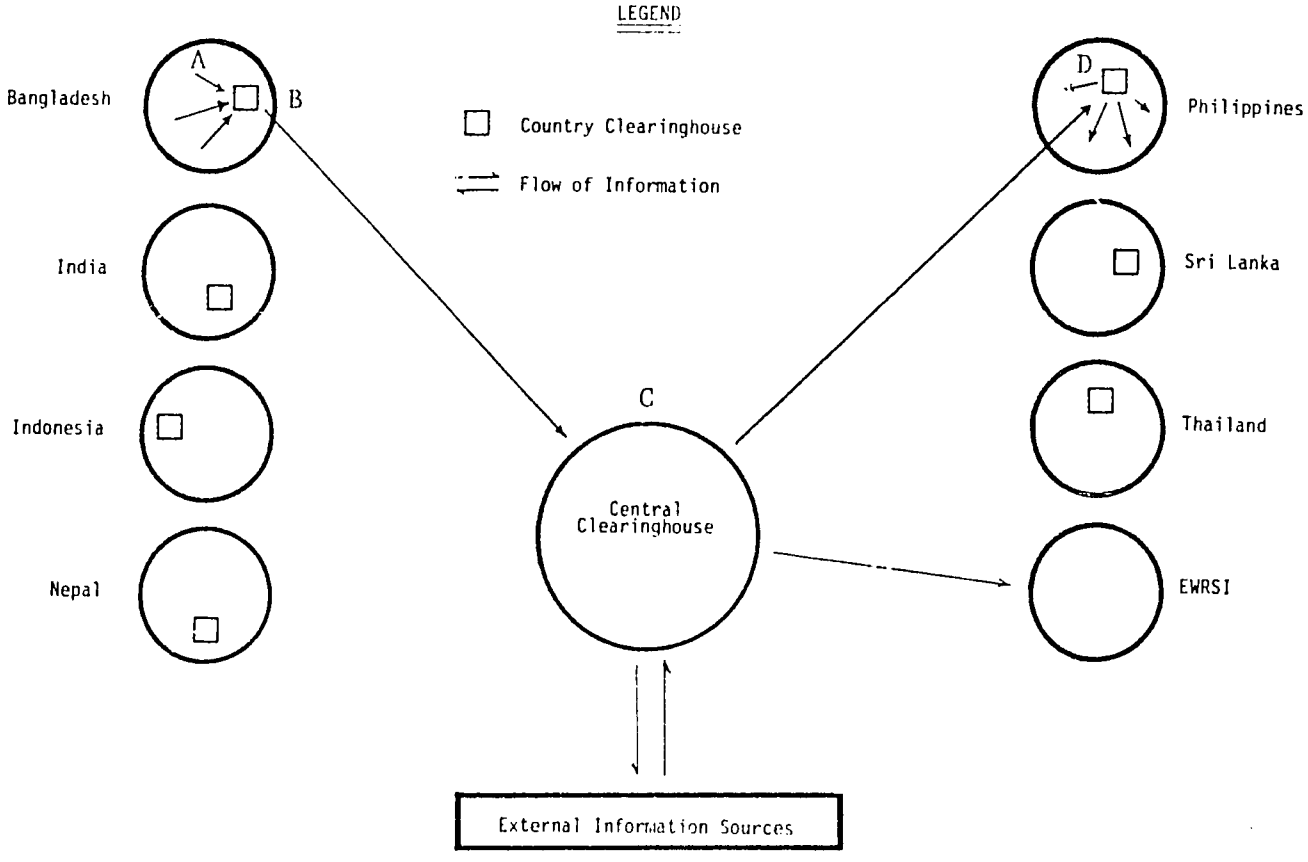
B. Identify, select, train and/or orient competent personnel to manage the ERDINET system - see section on Manpower and Budget Requirements for details on numbers and types of personnel.

C. Develop an operational plan for the ERDINET system, encompassing standards, policies, and procedures for management of the network. An ERDINET Operations Workshop will be convened before October 1980 to develop a uniform management strategy and quality control standards for the network. Workshop participants will include two persons from the Central Clearinghouse, one person from each Country Clearinghouse, two from RSI, and two resource persons from outside the network. Provisions will be made for adequate travel to maintain a high level of ERDINET involvement in ERD research and development activities.

Figure 4

ERDINET Exchange Modes

I. Document Exchange



A. Participating Individuals or Institutions

1. Provides documents to Country Clearinghouse

B. Country Clearinghouse

1. Actively seeks documents
2. Collects and processes documents
3. Sends eight (8) copies of documents to Central Clearinghouse (via bulk-rate airmail)

C. Central Clearinghouse

1. Collects and processes documents
2. Non-selective dissemination by bulk-rate airmail of documents to Country Clearinghouses and RSI
3. Notes acquisition of document for inclusion in bibliography, or Newsletter
4. If appropriate, informs external information sources of documents or mails copies to external distribution listees

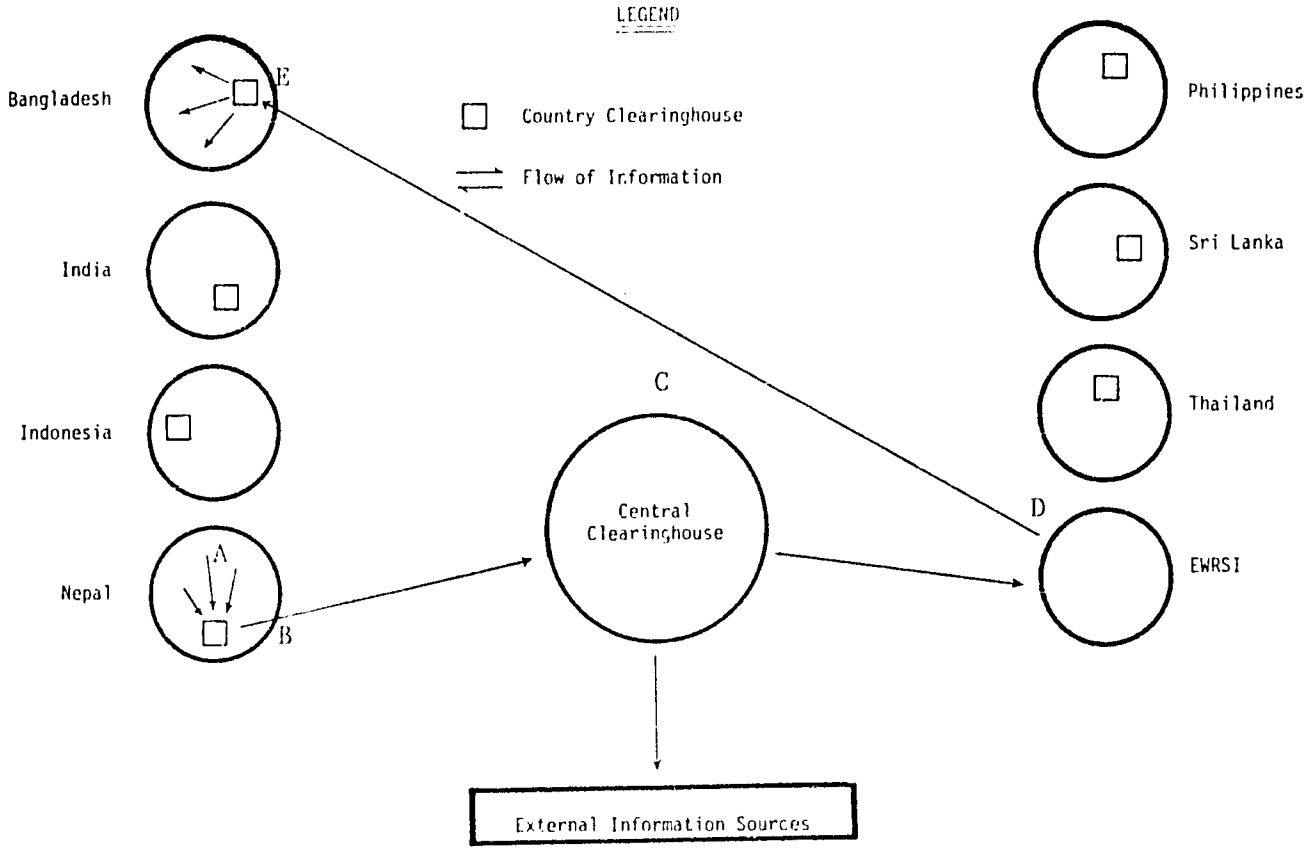
D. Country Clearinghouse

1. Selectively disseminates documents
2. Or notifies members of acquisition (with ordering information)

Figure 5

ERDINET Exchange Modes

II. Bibliographies and Directories



A. Participating Individuals and Institutions

1. Provide bibliographic or directory information

B. Country Clearinghouse

1. Collects information
2. Quality control check for correct citation procedures
3. Routes information to Central Clearinghouse

C. Central Clearinghouse

1. Solicits information for bibliographies (specific or general)
2. Collects, screens and formats reference or directory information; maintains quality control
3. Supplements bibliography information, routes information to EWRSI

D. RSI

1. Converts bibliographic and directory information into computerized publication
2. Supplements bibliography with external references
3. Bulk mails bibliographies or directories to Country Clearinghouses, Central Clearinghouse and external information organizations

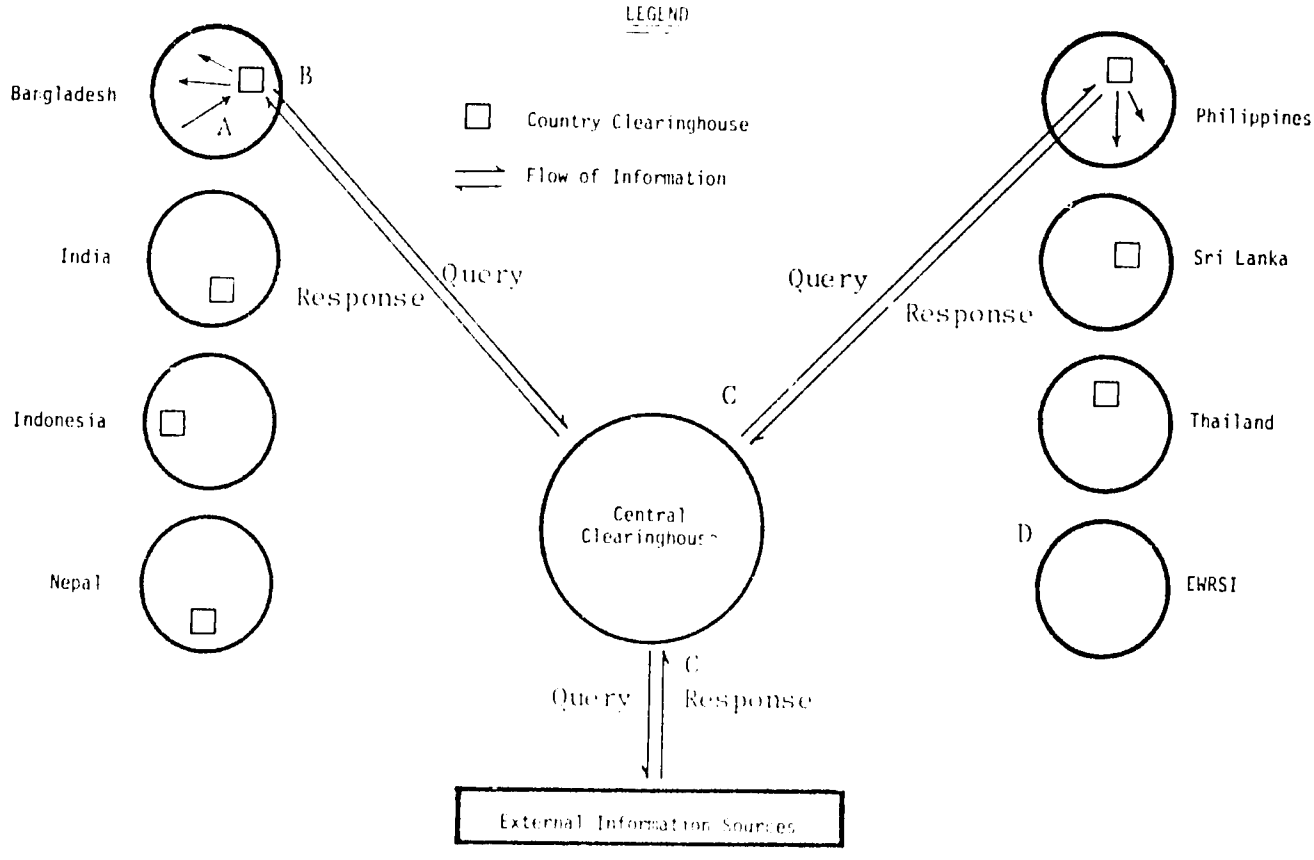
E. Country Clearinghouse

1. Mails bibliography or directory to participating individuals and institutions

Figure 6

ERDINET Exchange Modes

III. Technical Inquiry Service



A. Participating Individuals or Institutions

1. Submits request for information
2. Supply information upon request by Country Clearinghouse

B. Country Clearinghouse

1. Tries to identify in-country expertise
2. Submits request to Central Clearinghouse, if appropriate
3. Maintains directories and files concerning in-country information sources

C. Central Clearinghouse

1. Maintains directories and files, especially of external information sources
2. Queries seven Country Clearinghouses and EWRSI for information
3. Queries external information sources
4. Honors information requests from external information organizations

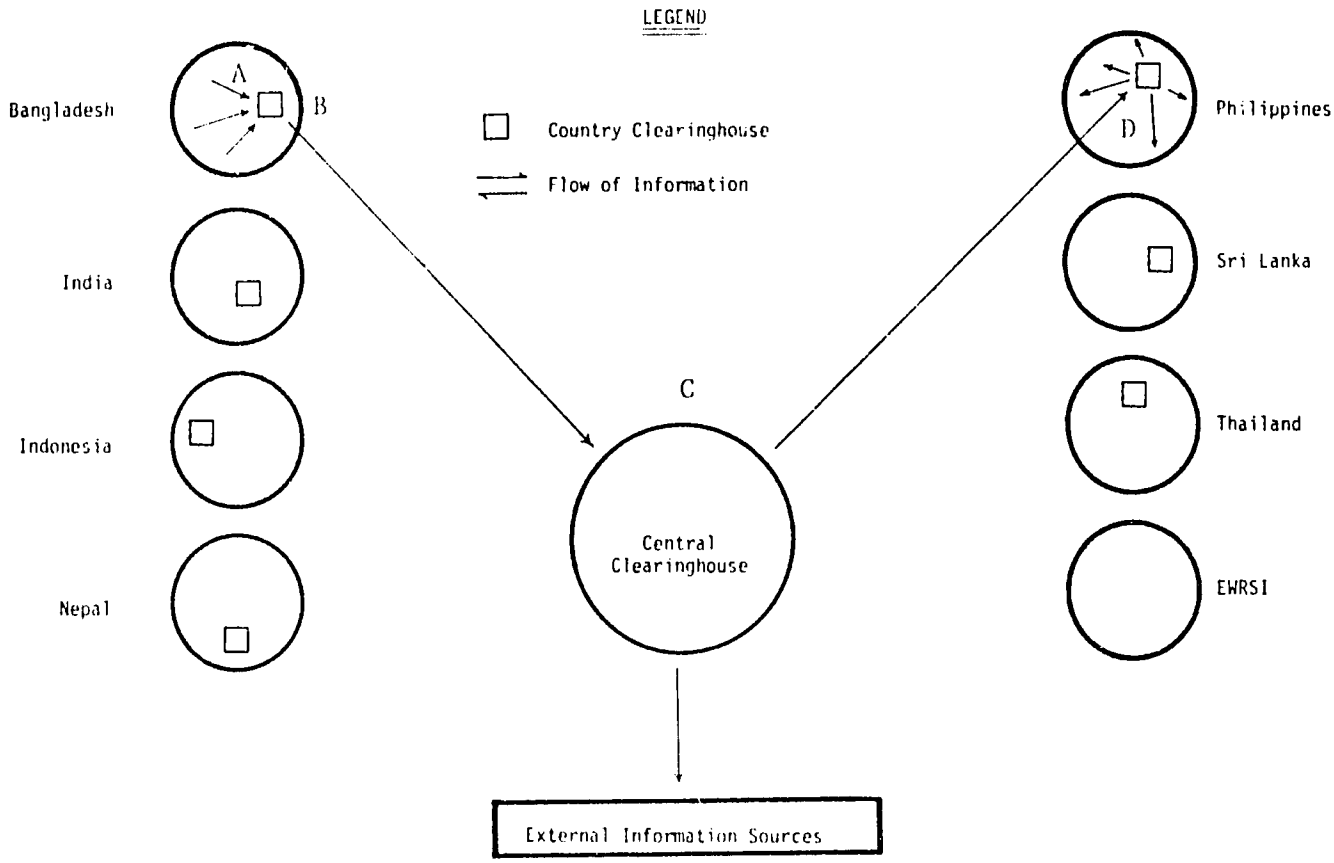
D. RSI

1. Assists Central Clearinghouse via commercial computerized information databases

Figure 7

ERDINET Exchange Modes

IV. Newsletter



A. Participating Individuals and Institutions

1. Provide articles and information to Country Clearinghouse

B. Country Clearinghouse

1. Actively seeks and collects articles, other information
2. Sends articles to Central Clearinghouse

C. Central Clearinghouse

1. Collects, edits, formats, publishes Newsletter
2. Bulk distributes Newsletter

D. Country Clearinghouse

1. Mails Newsletter to participating individuals or institutions

D. Document exchange will rely heavily on mimeograph and photocopy devices in each Country Clearinghouse. Arrangements will be made to lease or purchase devices not already available. The document replication volume by the end of Year 1 is estimated at 200 documents (10 pages each) per month from each Country Clearinghouse and 500 documents (10 pages each) per month from the Central Clearinghouse. Provisions will be made for cost-effective use of local and international postal services. Each Country Clearinghouse will mail about 50 pieces each month and the Central Clearinghouse an estimated 200 per month during the first year.

E. Produce for ERDINET several computerized annotated bibliographies. These will be produced by the computer facilities of RSI. Procedures for uniform coding and keywording of all bibliographic citations will be developed for use in ERDINET in conjunction with RSI and modified during the Operations Workshop.

F. Produce an ERDINET newsletter quarterly. About 600 copies will be bulk distributed by the Central Clearinghouse to the Country Clearinghouses for in-country distribution. The newletter will include letters, notes, research progress reports, ERDINET and ERD information, activity schedules, recent document acquisition by ERDINET Clearinghouses, and information in ERD-related activities and resources outside the network.

G. Establish linkages with external information sources and networks. Create and maintain directories and files of external information services so that technical information queries received from ERD institutions or individuals through the Country Clearinghouses can be routed efficiently to appropriate external information sources or networks for response.

ERDINET MANPOWER AND BUDGET REQUIREMENTS

The personnel required to operate an ERDINET of seven Country Clearinghouses and one Central Clearinghouse for a year is estimated at ten equivalent full-time positions. The budget section outlines specifics on personnel and operations costs. Together, participating ERDINET institutions can be expected to provide the equivalent of three to four personnel positions and up to one-half of the nonpersonnel costs associated with operating the network. This plan identifies opportunities for external donor agencies to augment available in-country resources with contributions for support of specialized personnel and hard-to-fund operational components such as network workshops, international travel, and equipment. (See budgets for analysis of host-institution contributions and externally funded requirements.)

Country Clearinghouses

It is estimated that each Country Clearinghouse will require a part-time coordinator (20%), a full-time information specialist, and, periodically, other technical and clerical personnel. Specific allocations are included in the Country Clearinghouse budgets for a quick copy capacity (xerography), bulk air mailing of documents, and local travel for out-

reach activities in behalf of in-country research teams. These resources would be used to service directly an average of four to seven in-country institutions sponsoring components of the ERD Program, and ten to forty individual researchers involved in ERD activities. Each Country Clearinghouse would also indirectly, through the Central Clearinghouse, engage the six other clearinghouses and three to six regional and international information services or networks.

Central Clearinghouse

The Central Clearinghouse would require about three full-time equivalent staff positions. These positions would include a full-time coordinator, a full-time library or information specialist, a half-time administrative assistant, a half-time editor or publication specialist, and, periodically, other technical and clerical personnel. Specific allocations are included in the Country Clearinghouse budget to provide for network liaison travel, to sponsor an annual ERDINET Operations Workshop, to produce a quarterly network newsletter, to acquire a modest reference collection for inter-institutional loan purposes and fees for external information services. These resources would be used to service directly the seven ERDINET Country Clearinghouses and interface with a number of other regional and international information services or networks. The Central Clearinghouse would also service indirectly, through the Country Clearinghouses, 30 to 50 institutional co-sponsors of the ERD Program and 100 to 200 individuals in these institutions engaged in coordinated ERD research efforts.

Resource Systems Institute

The RSI manpower contribution to ERDINET is estimated at two and a half persons including one-half equivalent researcher/fellow, two full-time professional interns and access to a computer programmer, a library specialist, and publication specialist. Additional resources will be available for computer services necessary to generate automated bibliographies and directories. Resources for printing and distribution of several computer-generated bibliographies and directories also will be available as well as modest funds for telephonic access to computerized databases in the United States and Europe.

DURATION AND VIABILITY

This plan addresses start-up and maintenance for ERDINET for a three year period (July 1, 1980-Jure 30, 1983). ERD participating institutions and in-country sponsors can be expected to contribute up to 50% of the total cost for the clearinghouse system during the initial phase of ERDINET development. A matching increment from external donor agencies is needed to move ERDINET through this initial phase and on to a self-financing status.

It is anticipated that the information being developed and shared in ERDINET will become increasingly valuable to many developing country institutions. Over time, an increasing proportion of ERDINET operating costs might be recovered from expanding developing country participation in the information exchange network. A charge-back strategy might be employed for this purpose. Details for such a strategy are yet to be developed. However, a gradual annual reduction of donor agency contributions can be anticipated in years two and three of the plan.

PROGRESS-TO-DATE

A Provisional Bibliography on Energy and Rural Development comprised of a computerized indexing of approximately 400 references was produced and mailed to participants of the ERD program before the ERD workshop in Chiang Mai.

A Thesaurus of Energy and Rural Development is in the final stages of preparation. This subject thesaurus is a hybrid of relevant descriptors contained in the Provisional Bibliography on Energy and Rural Development, and the Subject Thesaurus of the Energy Information Data Base developed by the United States Department of Energy Technical Information Center.

A general bibliography on Energy and Rural Development is in preparation, and will include approximately 1,000 references. A computer program (designed to run on an IBM 370/158) has been developed to provide an easy-to-use reference with subject and author indexes. This bibliography is scheduled for publication in fall 1980. Formulation of a bibliography on Energy Forestry for Developing Countries will begin in summer 1980. A specialized micro-thesaurus will be developed in conjunction with this activity.

THE INITIATION OF ANY OR ALL STRATEGIES AND ACTIVITIES OUTLINED IN THIS ERDINET DEVELOPMENT PLAN ARE CONTINGENT UPON ADOPTION OF THIS PLAN OR ITS MODIFICATION BY THE ERD STEERING COMMITTEE.

ERD NETWORK CLEARINGHOUSE ACTIVITY

Budget (Year 1 Estimate)

I. Country Clearinghouses (7)

	Host Institutions	External
1. Personnel		
Coordinator 20% time @ $1,200/mo x 7	$15,960	$ 4,200
Information Specialist, full time @ $400/mo x 7	-	33,600
Tech/clerical pool: $150/mo x 7	6,300	6,300
2. In-country Liaison Travel $500 x 7	-	3,500
3. Communications		
Postage, etc. @ $50/mo x 7	-	4,200
4. Replication		
Repography: 2000 pg/mo @ 0.08 x 7 200 x 10pp documents/mo x 7	6,720	6,720
5. Materials and Supplies		
@ $800/Clearinghouse	2,800	2,800
6. Facilities and Overhead		
Rental of space @ $400/mo x 7	33,600	-
7. Equipment		
Purchase or lease xerography machine @ $1,200/yr x 7	-	8,400
Country Clearinghouse year 1 total:	$65,380	$69,720
Total for Each Country Clearinghouse:	$ 9,340	$ 9,960

II. Central Clearinghouse (1)*	Host Institutions	External
1. Personnel		
ERDINET Coordinator full time @ $1,200/mo.	--	$14,400
Admin. Asst. 1/2 time @ $250/mo.	1,800	1,200
Information or Library Spec. full time @ $500/mo.	--	6,000
Editor/Pub. Spec. 1/2 time @ $200/mo.	--	2,400
Technical/Clerical Pool @ $350/mo.	4,200	--
2. Network Liaison Travel		
ERDINET personnel to US - Europe 1 trip @ $4,000	--	4,000
ERDINET personnel to Network Countries 4 Inter-Country trips @ $800	--	3,200
3. Network Operations Workshop		
10 participants @ $1,200 each/7days	2,000	10,000
4. Communications		
Mailings, (av. 200 PC/mos.), cables @ $300/mos.	--	3,600
5. Publications and Replication		
Newsletter: $500 x 4 issues x 600 dist.	--	2,000
Repography: 5,000 pp/mo @ 0.08¢	--	4,800
6. Access to International Databases--Fees for Services	--	2,400
7. Acquisition of Books and Periodicals	--	1,000
8. Facilities and Overhead		
Office space, furniture, typewriters etc. @ $500/mo.	6,000	--
9. Materials and supplies	2,000	2,000
10. Equipment (lease or rental)**	1,000	1,000
Central Clearinghouse year one TOTAL:	$17,000	$58,000

*Central Clearinghouse serves also as venue for host country clearinghouse

**Central Clearinghouse will use xerography machine provided for in the host country clearinghouse budget.

III. Resource Systems Institute (including AID funding)

	Host Institutions	External
1. Personnel	$ 29,600	-
2. Computer Services	5,000	-
3. Publication/Distribution	8,400	-
4. Travel	4,000	-
RSI Year 1 Total:	$ 47,000	-

Budget Recapitulation (Year 1)

Country Clearinghouses (7)	$65,380	$ 69,720
Central Clearinghouse	17,000	58,000
RSI	47,000	-
TOTAL:	$129,380	$127,720

Estimated Budget Requirements For First Three Years

Country Clearinghouses (7)	$196,000	$170,000
Central Clearinghouse	85,000	120,000
RSI	89,000	-
TOTAL:	$370,000	$290,000

APPENDIX 1
ATTENDEES
ENERGY AND RURAL DEVELOPMENT RESEARCH IMPLEMENTATION WORKSHOP
Chiang Mai, Thailand
February 5-14, 1980

Sponsored By

NATIONAL RESEARCH COUNCIL OF THAILAND
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APPENDIX 2
DOCUMENTS SUBMITTED AT THE WORKSHOP

A. ENERGY FOR RURAL DEVELOPMENT RESEARCH PLANS

Bangladesh

Supply and Demand of Forest Products and Future Development Strategies, Forest Section, Agriculture Division, Planning Commission, Dacca.

Maximization of Solar Energy Capture by Increasing Green Foliage over Homestead and Marginal Land, S. M. Jalil, Deputy Conservator of Forests, Rajshahi.

India

Energy for Rural Development, Report of the Research Planning Workshop, December 27-29, 1979, Indian Institute of Management (IIM), Ahmedabad.

Solar Energy for Rural Development in India, B. C. Jain, Jyoti, Ltd., Baroda.

Research Proposals: Biomass Centre, Madurai Kamaraj University, Madurai.

A Study of Energy Situation in Rural India: Proposal for a Pilot Survey and Questionnaire, Appropriate Technology Development Association, Lucknow.

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Energy and Rural Development in Indonesia: Structuring of the Baseline Data, H. Soesastro, Center for Strategic and International Studies, Jakarta.

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Perspectives in Research on Energy and Rural Development in Nepal, U. M. Malla, Member, National Planning Commission, Kathmandu.

Rural Energy Utilization and Productivity: A Study on Total Rural Energy Inputs and Production, S. P. Pradhan and S. R. Chalise, Tribhuvan University, Kathmandu.

Fuelwood Utilization Efficiency Enhancement Project, S. P. Pradhan, Tribhuvan University, Kathmandu.

Integrated Rural Development Proj[illegible] RAPTI, Component Concept Paper, Alternate Energy Sources and App[illegible]e Technology, Agriculture Project Service Centre (APROSC), Kathmand[illegible]

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ENERGY FOR RURAL DEVELOPMENT RESEARCH PLAN

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Philippines

Pilot Biogas Promotion Project in the Philippines, R. M. Lopez, Ministry of Human Settlements, Manila.

Pilot Integrated Energy Village Project (Philippines), Ministry of Human Settlements and Ministry of Energy, Manila.

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Country Report for Thailand, National Research Council, Bangkok, 1980.

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Preliminary Research Plan on Energy and Rural Development, R. Morse, et. al., Resource Systems Institute, East-West Center, Honolulu, 1980.

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An Analytical Framework for Socio-economic Assessment of Technological and Policy Alternatives, Ramesh Bhatia, Resource Systems Institute, East-West Center, Honolulu, 1980.

A Proposal to Study the Potential of Biomass Technologies for Rural Development in the Developing Countries, S. Sarvate and J. P. Holdren, Energy and Resources Group, University of California, Berkeley, California, 1980.

Appendix 2, continued

Bangladesh

"Review of Energy and Rural Development in Bangladesh," Khalid Mahmud, Deputy Chief, Natural Resources and Energy Section, Planning Commission.

"Case Study of a Biogas Plant," M. Eusuf, T.A. Bhuiyan and Mahatabuddin, Institute of Fuel Research and Development, BCSIR.

India

"Replacement of Cowdung by Fermentation of Aquatic and Terrestrial Plants for Use as Fuel, Fertilizer and Biogas Plant Feed," C.R. Das and S.D. Ghatnekar.

"Energy Requirements in Agriculture Sector in India: Some Empirical Observations," S. Mukherjee and R. Jagannathan, Indian Institute of Management (IIM), Ahmedabad.

"Comparative Analysis of Social Cost-Benefit Studies of Biogas Plants," S. Mukherjee and A. Arya, IIM, Ahmedabad.

"Small Sets With Big Benefits," Jyoti Hydel Sets, Jyoti Ltd.

Indonesia

"Rural Development Policy in Indonesia and the Role of Energy in Its Implementation," T. Soerjadi, R. Razak, and S. H. Darsono.

"Some Experiences in Biogas Application in Indonesia," R. Razak.

Nepal

"Bio-Gas in Nepal: The Prospect and Problems," A.B. Karki, Agriculture Project Service Centre (APROSC).

"Techno-Socio-Economic Study of Bio-Gas Plants in Chitwan "District," Nepal, A.B. Karki, K.M. Pyakural, Nancy Axinn.

Sri Lanka

"Rural Energy Consumption and Resources Survey Energy Unit," Ceylon Electricity Board.

"An Overview of Energy and Rural Development Research and Implementation in Sri Lanka," B.P. Sepalage, 1980.

"A Review of the Energy and Electrification Components Proposed under Integrated Rural Development Projects in Sri Lanka," G.T. Fernando, 1980.

REPORTS OF ONGOING RESEARCH AND COUNTRY BACKGROUND PAPERS

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"Rural Development in Sri Lanka. Some Problem and Prospect for Solution through Biogas Technology," M. Amaratunga, 1980.

Thailand

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United States

"Energy for the People of Asia and the Pacific," H.S. Brown and K.R. Smith, 1980.

"Tropical Tree Legume Cooperative Research," J.L. Brewbaker, University of Hawaii: East-West Center.

EAST-WEST CENTER—officially known as the Center for Cultural and Technical Interchange Between East and West—is a national educational institution established in Hawaii by the U.S. Congress in 1960 to promote better relations and understanding between the United States and the nations of Asia and the Pacific through cooperative study, training, and research. The Center is administered by a public, nonprofit corporation whose international Board of Governors consists of distinguished scholars, business leaders, and public servants.

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