

PARTICIPATORY EVALUATION OF FUELWOOD PROGRAMS

Proposed by:

East-West Center
Resource Systems Institute

and

Environmental and Policy Institute

to the

United States
Agency for International Development

May 11, 1984

PARTICIPATORY EVALUATION OF FUELWOOD PROGRAMS

Abstract

Evaluations will be made through participatory case studies in two or three agroclimatic regions in order to reveal and document those sources of household, community, and ecological variation in rural fuelwood systems that influence the success or failure of forestry and fuelwood policies and resource allocation programs. The success of these policies and programs depends critically - though not solely - on the assessments made and decisions taken by millions of farm families and thousands of communities on the priority they attach to fuelwood needs, on the selection of land and tree species for fuelwood plantings, and on the negotiation and implementation of management plans for sustaining fuelwood growth and distributing its outputs. This study is designed to reveal systematic lessons on factors that affect such local assessments and decisions, and to derive policy conclusions and improved program planning and implementation methods based on increased understanding of these factors.

The evaluative case studies will be conducted with the active participation of researchers and rural residents in the ecoregions and villages involved. Comparability will be sought by using as an analytical instrument the Project Appraisal module developed in the concurrent program for Participatory Rural Energy Development. Ex post application of this appraisal method by farmers, village project organizers, forest research and extension staff, and other relevant participants is designed to produce these results: (1) data on the costs, output, distribution, and use or expected use of fuelwood and the resulting incomes of farm families and others involved; (2) information on the effects of variations among socioeconomic groups, villages, and agroecosystems on the success and failure of projects; (3) refinement of project appraisal methods and data for wider use in rural energy development programs; and (4) interpretation of the findings for fuelwood and other bioenergy policies and programs.

IDENTIFICATION AND SIGNIFICANCE OF ISSUES

The majority of the World's people, who live in rural areas of developing countries, rely for most of their energy needs on traditional biomass fuels such as firewood, crop residues, and dried animal dung. To them, in many areas, the most important energy crisis is that caused by the increasing difficulty of obtaining cooking and heating fuel due to population pressure, deforestation, and environmental depletion. The insecurity and cost of today's oil make it probable, in addition, that the type of energy transition from biomass to fossil fuels that provided high quality energy and contributed to increasing agricultural productivity in the presently rich countries will be delayed or significantly modified. The continuing importance of biomass energy necessitates a sustained focus on assessments, planning, and policy environments that will foster effective innovations and choices among renewable and nonrenewable energy sources.

The difficulties in measuring local variations in forest systems result in wide disparities in national and global estimates of wood fuel deficits. Substantial agreement exists, nevertheless, that there is clear

evidence of serious and in some regions increasing trends of fuelwood depletion with resulting adverse effects on adequacy of cooking fuel, productive use of land and water resources, rates of substitution by other biomass fuels, and environmental sustainability.

RESEARCH PLAN

The research will comprise three to five case studies, conducted on a comparable basis, of fuelwood development projects undertaken four or more years ago in two or three ecoregions representing fuelwood deficit conditions in India, Thailand, and possibly Nepal. The present proposal outlines the objectives, scope, conceptual framework, data categories, and research methods to be pursued, it being understood that research collaborators in each participating country will engage at the outset in the finalization of detailed plans for project and site selection, conduct of participatory evaluations, analysis and comparison of findings, and formulation of policy conclusions.

Objectives

1. To identify projects that have succeeded or are well on the way to succeeding in alleviating fuelwood deficits for specific socioeconomic groups, villages, and ecological regions.
2. To identify projects that have failed to achieve their intended objectives.
3. To quantify the results of successful projects in terms of costs, availability, distribution, and use of fuelwood; and in terms of income, substitution for other biomass fuels, employment generation, and other economic benefits.
4. To ascertain through participatory conduct of the case studies those factors that contributed to the success or failure of the project and of associated policies and program designs.
5. To draw policy conclusions specifically bearing on issues of fuelwood research, development, and extension; market development and prices; loan and/or subsidy allocations; and fuelwood/forestry program organization and management.
6. To refine participatory research methods and produce project assessment data in forms adaptable by farm families and village residents in similar or different ecoregions through the cooperation of research institutions in these and other countries.

The research results will also be analyzed for their evidence on the relationships between energy and agriculture, and on the reorientation of fuelwood and forestry programs toward active bioresource management strategies, as sought in the AID terms of reference for Energy Policy and Planning Research.

Scope

It is intended that the projects selected for evaluation include cases involving private farm forestry, village woodlots, and hedgerow or ribbon plantings, each where possible within a particular type of agroecosystem. For purposes of the present study, largescale forest plantation projects would be excluded. The scope of analysis will extend to an interpretation and adaptation of environment-specific results for comparison with similar or other ecosystems, but will not attempt to extrapolate such ecosystem comparisons to the national scale.

Conceptual Framework and Hypothesis

The organizing concepts for this research are based on the central conclusions and research designs established in the multicountry volume, Rural Energy to Meet Development Needs: Asian Village Approaches (Nurul Islam and others 1984). These concepts are more specifically defined in the prospectus, Participatory Rural Energy Development (CUSRI/RSI 1983). In this context, a two-part working hypothesis is established for the present evaluative research:

1. Policies focusing on fuelwood market development, including the strengthening of transport infrastructure and linkages to industrial wood fuel use, can be expected to provide incentives to fuelwood plantation especially by holders of large farm lands. Evaluation in terms of such output measures should be combined with assessments of how far the increased fuelwood output meets the needs of fuel-deficit families, whether the ensuing land transactions tend to increase inequality in land distribution, and whether such largescale wood fuel plantings are operated and maintained in a manner consistent with sustainability of the environment.

2. Policies focusing on needs of fuel-deficit families, including fuelwood research, development and extension, legislative and administrative consideration of land tenure practices and rights, community organization and management of fuelwood plantings, and credit and/or subsidy programs, must also be evaluated in terms of fuelwood output but require examination of other results as well. Success, for such policies and programs, means the achievement of situations in which families, groups of families, and/or communities have mobilized land, labor, technical knowledge, planting materials, and other production inputs in the amounts and proportions necessary to increase fuelwood production and to assure its distribution in quantities adequate to meet the needs of fuel-scarce users.

In operational terms, the two types of policies may or may not be clearly distinguished. A derived hypothesis is that the second policy set, apart from its political and structural sources of support, is likely to require more specific knowledge of those local conditions that influence wood fuel use, production, and exchange. Resource mobilization in the second context implies, more specifically, that the local project implementers have developed or acquired credible information and confidence regarding the value and amounts of net benefits in the project. Their assessment of the project, whether formal or informal, had convinced these families and communities that its expected results justified their investments of land, labor, and associated resources.

A central conclusion of the cited book is that wide variations in fuelwood use and sources occur among households in a given village, among villages even within a reasonably homogeneous agroecosystem, and in turn among such agroecosystems. An implication of the operational hypothesis derived above, in this light, is that the weakest knowledge base for policy and program formation is not that pertaining to broad ecosystem variables but to those factors within an ecosystem that are associated with variations

(1) between villages and

(2) between socioeconomic groups within a village
with respect to:

- (a) fuelwood needs, use patterns, and use efficiencies;
- (b) supply-demand balances, deficits, and interfuel substitution;
- (c) availability and organization of land and water resources and other technical inputs for fuelwood production;
- (d) proportions of fuelwood characterized by nonmonetized production and exchange relations; and,
- (e) pricing and marketing of commercial fuelwood supplies.

Research priority is therefore addressed to such local variations. It is important, as well, to relate such intervillage and intravillage variations to ecosystem characteristics and eventually to factors affecting regional and national fuelwood supply-demand balances. The results of evaluative case studies will therefore be analyzed comparatively in the context of ecosystem indicators established from secondary data sources, to contribute to building understanding of these wider variations and their policy significance.

Fuelwood and Farming System Relationships

Wood fuel production, collection, processing, and use are a set of activities linked in complementary, supplementary, and competitive relationships with cropping and animal husbandry activities in a farming system context. Socioeconomic contexts for these relationships are shown schematically on Figure 1, suggesting the very large number of factors that families and groups may need to assess in reaching decisions on the set of activities involving fuelwood. It should be emphasized that Figure 1 is not seen as a black box for collection of detail data; this would be a task for basic research especially suited to economic anthropology. Yet Figure 1 suggests the framework of input-input, input-product, and product-product relationships within which farming system residents must design alternative fuelwood projects and undertake their assessment. Specifically, this framework can be used to identify the parameters of alternative wood fuel projects, as a basis for appraising each alternative through use of partial farm budget methods (see D.A. Hoekstra 1983).

Data to be Collected and Analytical Instruments

Analytical tools being developed for Participatory Action Research (PAR) for rural energy planning (CUSRI/RSI 1984) cover successive stages of the project cycle including (1) problem identification, (2) project innovation and design, and (3) project appraisal. Each stage establishes criteria for application in the next stage. Problem identification by local residents in interaction with planners, researchers, or facilitators entails discussion and agreement on priorities and criteria for establishing alternative project concepts. The formulation of alternative input and product mixes in project designs defines the specific quantities and values or value indicators to be calculated and compared in project appraisals. Elements in local appraisal of fuelwood product-product alternatives are illustrated in Figure 2, in a simplified matrix for assessment, negotiation, and decision among sites controlled by different families and groups and suited to silviculture for alternative output functions and services.

These fuelwood products and services are available in varying amounts and proportions as surplus to the producers' own requirements, and thus offered for sale at a price in monetized markets. Other quantities are retained by the household or subject to in-kind local exchange. The PAR project appraisal instrument includes categories for assigning values to nonmonetized products and services in units and terms commonly used in the local area. These value categories include:

- (a) Products - customary barter quantities and/or labor units;
- (b) Labor - customary product units; customary range of peak season and off season variations;
- (c) Energy quality indexes - preference scales including index values assigned to combustion, smoke, storage, and organoleptic properties; and
- (d) Indirect production inputs (such as manure, leaf mulch, fodder) - proxy values (Elizabeth Foster 1983) and literature estimates of imputed contribution to output.

The project appraisal instrument as refined and tested in PAR rural energy planning studies will be reduced for purposes of the present research to a set of core categories that permit comparisons across households, villages, and ecospheres. The instrument will retain sets of particularistic indexes that may or may not permit direct comparisons but do reveal weights and values that have significance in specified social, environmental, and cultural circumstances.

RELATED RESEARCH

Islam and others (1984) provide a review of current research on rural energy, with individual chapters by authors in six Southern Asia nations including the countries involved in the present proposal. The book's chapter "Supplying Firewood for Household Energy," by Rick Van Den Belde, University of Hawaii College of Tropical Agriculture and Human Resources,

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Site Class	Area by Owner Group (ha.)	Functions and Outputs						
		Fuelwood Species A	Fuelwood Species B	Fodder	Fruit/Nuts Edible Flowers	Erosion Control	Mulch/Green Manure	Other Products and Services
ARABLE								
GRAZING								
HOMYARD								

constitutes contemporary technical and research grounding for the present evaluative studies. Continuing research by the Environment and Policy Institute on these issues is summarized in the attached qualification material. The present proposal is directly complementary to the 1984-1986 Workplan now being undertaken by the Resource Systems Institute in cooperation with Chulalongkorn University Social Research Institute (CUSRI/RSI 1984) as commissioned for the UNDP/ESCAP/FAO Regional Energy Development Programme Activity on Rural Energy Planning Studies. CUSRI and RSI are assigned responsibility, in the Workplan, for developing methodological guidelines and providing onsite consultation for research teams using PAR methods to formulate and implement rural energy plans in selected sites in Bangladesh, Nepal, and provisionally Bhutan. Fuelwood, forestry, and other bioenergy resource development and management receive central attention in these complementary planning studies.

PLANNED COLLABORATION

The Resource Systems Institute and the Environment and Policy Institute of the East-West Center are cooperating in this research project and are undertaking to arrange for joint conduct of the research with institutions in India, Thailand, and possibly Nepal. The advance time available for preparation of this proposal has been insufficient to complete detailed arrangements for this collaboration. We expect to accomplish such arrangements in consultation with research principals in the countries concerned who have been active as Research Fellows in the Energy Program of RSI and the Human Interactions with Tropical Ecosystems Program of EAPI. Prospective collaborators include:

India

Mr. Manubhai Desai, Bharatiya Agro-Industries Foundation (BAIF), Pune, or designate.

Dr. C. L. Gupta, Director, Tata Energy Research Institute (TERI), Pondicherry research center.

Dr. K. M. Tewari, President, Forest Research Institute and Colleges (FRIC), Dehra Dun, or designate.

Mr. Varun Vidyarthi, Principal Researcher, Appropriate Technology Development Association (ATDA), Lucknow, or designated alternate.

Thailand

Dr. Amara Pongsapich, Chulalongkorn University Social Research Institute (CUSRI), or designate.

Dean, College of Forestry, Kasetsart University (KU), or designated alternate.

Nepal

To be determined.

We are requesting each research principal to review this proposal, providing written comments and amplifications and indicating whether his institution is prepared to join in the project. Agreement by two or more institutions in India and one or more in Thailand and/or Nepal will establish the collaborating consortium.

Case Site Selection

The principal researchers from RSI, EAPI, and participating Asian groups will meet in India or Thailand at the outset of the project to review the conceptual framework and policy hypotheses of the study, finalize the research plan, establish guidelines for case site selection, review and test participatory evaluation techniques, refine and adapt the Project Appraisal instrument for ex post application, agree on formats for data analysis, and develop a preliminary outline for case reports and the final research report.

Guidelines for site selection will be oriented to inclusion of several project types, including:

- o social and community forestry projects sponsored by forest departments (e.g., Uttar Pradesh government, Royal Thai Forest Department).
- o private fuelwood plantings evidently in response principally to market stimuli (e.g., Tamil Nadu casuarina woodlots, fuelwood/fodder plantings in the Rachaburi area, Thailand).
- o projects sponsored by voluntary organizations with government support (e.g., integrated dairy and fuelwood/fodder project, Chitrakut, Uttar Pradesh). (The examples are indicative only).

Provision is made in conjunction with the research organization meeting for the principal researchers, as a team, to conduct a rapid appraisal of not less than two representative projects as a step toward selection of evaluation sites and finalization of the research design.

Participatory Evaluations

Only rural producers and users of energy have the experience that forms the basis of local knowledge about existing amounts, forms, and attributes of rural energy, and about current needs. This information is essential to scientists, development planners, and policy makers. This need for two-way information sharing is a principal foundation of the Participatory Rural Energy Development program.

Participatory evaluations of fuelwood and other rural energy programs are a specific step in the PAR project cycle. Use of participatory methods may be visualized more specifically in the wider context of PAR as defined in the Workplan on Rural Energy Planning Studies (CUSRI/RSI 1984):

The goals of PAR are to enhance the abilities of rural people and of scientists and planners and to strengthen the interaction between these groups in identifying,

assessing, and organizing energy resources and technologies to meet basic and development needs.

Participatory Action Research combines the positive elements of two previous approaches, participatory research and action research. Participatory research involves local residents, external resource persons, and development planners in collaborative identification of problems and sharing of information with specific emphasis on integrating traditional and newly developed knowledge. It is not necessarily action oriented. Action research stresses initiating an activity based on available information with the built in flexibility to modify the activity through continually testing, monitoring, and adding new information. This approach has not always been participatory. Participatory action research, then, is based upon mutual respect and collaboration in gathering, processing, and sharing all relevant information and upon initiating activities in a more timely manner with participation of all concerned.

The present research design omits the "action" phase of PAR, focusing instead on data collection and evaluation on an ex post basis of actions previously taken in the selected projects. It is expected that the involvement of project sponsors, technical experts, and area residents as active participants in the evaluation process will reveal significant aspects of their particular knowledge, incentives, decision steps, and negotiating and organizing procedures in the fuelwood project concerned. The project cycle instrument, "Information Gathering and Processing for Evaluation of Wood Fuel Projects," in preparation by Marilyn Hoskins as a component of the FRED curriculum, will be utilized for this purpose. In addition, orientation and training in PAR techniques will be provided for research team members prior to onsite evaluations.

It is provisionally assumed that the research team will reside in the project area for a period of two-three months in the participatory evaluation phase.

PROJECT MANAGEMENT PLAN

The provisional Project Management Plan, dates subject to confirmation on receiving the grant award, is charted on the following page.

PRINCIPAL INVESTIGATORS

Two or more RSI and EAPI research staff will assume principal roles in this project on behalf of the East-West Center, selected among these individuals on the basis of current assignments at the time the grant is awarded:

Dr. Deepak Bajracharya, Research Fellow, RSI. Co-Coordinator, ERD.

Dr. Marcia Gowen, Research Fellow, RSI. Pacific Island Energy Studies Program

PROJECT MANAGEMENT PLAN (Provisional)

	1984			1985											
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
Research institution and policy agency orientation	-----														
Staff selection		-----													
Research design meeting and site appraisal			--												
Staff orientation and training			-----												
Instrument pretests			-----												
Case site selection			-----												
Participatory evaluations				-----											
Data analysis and interpretation								-----							
Case reports									-----						
Evaluation review meeting and report preparation												--			
Report review													-----		
Editing														-----	
Publication															-----

Mr. Richard Morse, Research Associate, RSI. Co-Coordinator, ERD.

Dr. Kirk R. Smith, Research Associate, RSI. Energy Program Leader.

Mr. Napoleon Vergara, Research Associate, RSI. Human Interactions with Tropical Ecosystems Project, Agroforestry Project Leader.

Resumes of these EWC staff are attached.

INSTITUTIONAL QUALIFICATIONS

Please see attached program and staff summaries:

Resource Systems Institute
Energy Systems Program, RSI
Environment and Policy Institute
Human Interactions with Tropical Ecosystems
Program, EAPI

CURRENT SUPPORT

The current support of the senior investigators is provided on a full-time basis by the East-West Center.

BUDGET⁽¹⁾

ITEM	RSI/EAPI	ASIA Institutions	AID
SALARIES AND STIPENDS			
<u>EWC</u>			
Principal researchers 6 p.m. (2)	16,000	---	9,000
Research interns 4 p.m.	1,600	---	1,600
Secretarial	1,000	---	2,000
	<u>18,600</u>	<u>---</u>	<u>12,600</u>
<u>ASIA Institutions</u>			
Principal researchers 16 p.m.	---	5,000	5,000
Researchers 32 p.m.	---	4,000	4,000
Data analysis	---	2,000	2,000
Secretarial	---	2,000	2,000
	<u>---</u>	<u>13,000</u>	<u>13,000</u>
TRAVEL AND SUBSISTENCE			
Research design meeting			
2 HNL-INDIA-HNL	3,500 ⁽³⁾	---	3,500
1 BGK-INDIA-BGK	---	---	800
Subsistence 4 x 10 x \$35	---	---	1,400
Incountry	---	2,000	---
Evaluation review			
2 HNL-BGK-HNL	2,000 ⁽³⁾	---	2,000
2 INDIA-BGK-INDIA	---	---	1,600
Subsistence 4 x 15 x \$35	---	---	2,100
	<u>5,500</u>	<u>2,000</u>	<u>11,400</u>
	=====	=====	=====
	24,100	15,000	37,000
Indirect Costs @ 35%	---	---	13,000
TOTAL	<u>24,100</u>	<u>15,000</u>	<u>50,000</u>

(1) Assumes 3-4 case studies. (2) Person-months. (3) Part cost-shared with related programs.

REFERENCES

- Chulalongkorn University Social Research Institute (CUSRI) and East-West Center Resource Systems Institute (RSI). 1984. Workplan on Rural Energy Planning Studies, Regional Energy Development Programme Activity C.1 (1984-1986). Honolulu, Hawaii.
- Hoekstra, D.A. 1983. The Use of Economics in Agroforestry. Nairobi, Kenya: International Council for Research in Agroforestry.
- Islam, M. Nurul, Richard Morse, and M. Hadi Soesastro, eds. 1984. Rural Energy to Meet Development Needs: Asian Village Approaches. Westview Press (forthcoming).
- Pongsapich, Amara and Deepak Bajracharya. 1983. Participatory Rural Energy Development. Honolulu, Hawaii: Chulalongkorn University Social Research Institute and East-West Center Resource Systems Institute.

Curriculum Vitae

DR. DEEPAK BAJRACHARYA
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Resource Systems Institute
1777 East-West Road
Honolulu, Hawaii 94868, USA
Telephone: (808) 944-7521
Cable: EASWESCE
Telex: 743-0331

Personal Information

Date of Birth: January 3, 1949
Nationality: Nepalese
Marital Status: Married with two daughters (born 1976 and 1980)
Language Proficiency: English, Newari, Nepali, Persian, Hindi, Urdu.

Academic Qualifications

Doctor of Philosophy in Science Policy, 1982, University of
Sussex, Falmer, Brighton, U.K.

Master of Science in Environmental Engineering, 1972, Stanford
University, Stanford, California, U.S.A.

Bachelor of Science in Civil Engineering, 1970, Lafayette
College, Easton, Pennsylvania, U.S.A.

Intermediate of Science, 1966, Amrit Science College, Tribhuvan
University, Kathmandu, Nepal.

Awards

East-West Center Makana (Honor) Award for distinguished
contributions to the Energy for Rural Development Project,
September, 1983.

Work and Research Experiences:

Jan 1981 - present Research Fellow, Energy for Rural Development
Project, East-West Center, Resource Systems
Institute, Honolulu, Hawaii.
Activities: Coordinator, Participatory Rural Energy
Development Project and Nutrition Energy and Work
Project.

Nov 1983 - Dec 1983 FAO Consultant. Preparation of Training Materials
and Training Activities for Rural Energy
Planning.

Apr 1983 FAO Consultant and Rapporteur, Rural Energy Planning
Seminar, 9 - 29 April, 1983, Beijing, People's
Republic of China.

- Feb 1983 - Mar 1983 Rural Energy Systems Consultant, UNDP/ESCAP Review Mission of the Regional Energy Development Programme to Bangladesh, People's Republic of China, India, Malaysia, Philippines, and Thailand
- Dec 1981 - Jul 1982 Energy Consultant, Resource Conservation and Utilization Project, Kathmandu, Nepal.
Activity: Action research in Gorkha, Western Nepal, to test the compatibility of energy technologies with respect to local needs and priorities in three sites of one village panchayat.
- Mar 1980 - Dec 1980 Research Intern, Energy for Rural Development Project, East-West Center, Resource Systems Institute, Honolulu, Hawaii
- Jan 1976 - Feb 1980 Pre-Project Fellow, International Development Research Center, Canada.
Activity: Pursue Doctor of Philosophy Degree at the University of Sussex
- Jun 1977 - Feb 1979 Coordinator, Rural Energy Survey, Energy Research and Development Group Institute of Science, Tribhuvan University, Kathmandu, Nepal.
Activity: Survey of energy consumption patterns in three villages representing the Mountain, Hill and Terai regions in Kosi Zone, Eastern Nepal.
- Jun 1975 - Jan 1976 Research Fellow, Biogas Development Scheme, Centre for Endogenous Development Studies, and Advisor, Selseleh Integrated Development Project, Lorestan, Iran.
Activities: Establishment of a biogas plant in the project area and study of its implications. Also training of local health cadres (*behvari*) with special emphasis on public health and sanitation.
- Jun 1973 - May 1975 Advisor in Environmental Engineering, Department of the Environment, Human Environment Division, Tehran, Iran.
Activities: Establishment and coordination of the Environmental Engineering Task Force. Setting up regulations for air and water pollution control. Establishment of two research stations for monitoring river water quality and industrial effluent discharge along the Caspian Sea basin.
- Sep 1972 - Jun 1973 Environmental Engineer, Ryckman, Edgerley, Tomlinson & Associates, St Louis, Missouri, U.S.A.
Activities: Treatment plant design based on laboratory study for treating the mixed domestic and industrial wastewaters in East St Louis, Illinois. Also coordination of the questionnaire survey on health effects due to air pollution in

the inner city areas of St. Louis under the Community Health Effects Surveillance Systems (CHESS) program of the U.S. Environmental Protection Agency.

Mar 1972 - Jun 1972

Conference Coordinator, Oi Committee International, St. Louis, U.S.A.

Activity: Coordination of the Conference on Problems of the Human Environment in the Third World held in Stockholm, Sweden, parallel with the United Nations Conference on the Human Environment.

Oct 1970 - Mar 1972

Research Assistant, Department of Civil and Environmental Engineering, Stanford, California, U.S.A.

Activities: First, pyrolysis of solid waste and production of activated carbon for advanced waste treatment. Second, pilot study of the efficacy of aerobic nitrification filter for wastewater treatment.

Selected Papers and Publications

Organizing for Energy Need Assessment and Innovation: Action Research in Nepal. In Rural Energy to Meet Development Needs: Issues and Methods, M. N. Islam, R. Morse, and H. Soesastro (eds.) Westview Press, Boulder, Colorado, 1984. (In press).

Converting Rural Energy Needs to Opportunities, *ibid.*
(Coauthors: R. Morse, C.J.P. Colfer, B. Gills, M. Wulfe).

Fuel, Food, or Forest: Dilemmas in a Nepali Village. World Development, Vol. 11, No. 12, 1983, pp. 1057-1074.

Deforestation and the Food/Fuel Context: Historico-Political Perspectives from Nepal. Mountain Research and Development, Vol. 3, No. 3, 1983, pp. 227-240.

Rural Energy Planning in the Developing Countries of Asia. Presented at the FAO/REDP Rural Energy Planning Seminar, 9-29 April, 1983, Beijing, People's Republic of China

Energy for Rural Enhancement. The Rising Nepal, November 21, 1982. Kathmandu, Nepal.

Implications of Fuel and Food Needs for Deforestation. An Energy Study in a Hill Village Panchayat in Eastern Nepal. D.Phil. Dissertation submitted to the University of Sussex, Falmer, Brighton, U.K., 1981.

Fuelwood and Food Needs versus Deforestation: An Energy Study of a Hill Village Panchayat in Eastern Nepal. In Energy Analysis in Rural Regions: Studies in Indonesia, Nepal and

the Philippines, Atje et al. ERD Program Report PR-80-2, East-West Resource Systems Institute, Honolulu, Hawaii, 1980. Also presented at the ESCAP/IEA/EEC Workshop on Energy Statistics, 6-11 October 1980, Karachi, Pakistan. (STAT/WES/6).

Energy Research in Rural Nepal: Past Experience and Future Focus. ibid. (Coauthor, Deanna G. Donovan).

Technology for Self-Reliance, or, Why Cow-dung Gas is Needed in Oil-Rich Iran. In Self-Reliance, J. Galtung, R. Preiswerk and P. O'Brien, (eds.), Bogle-L'Ouverture Publications, London, 1980. (Coauthor, M. Taghi Farvar).

Fuelwood Consumption in the Nepal Hills: A Comparison of the Annual Recall and the Weekly Recorded Data. Presented at the Conference on Rapid Rural Appraisal, 4-7 December 1979 at the Institute of Development Studies, University of Sussex, Brighton, U.K.

Rural Energy utilization Patterns: Some Preliminary Observations from Pangma. Presented at IDRC Project Identification Meeting, February 1979, Bangalore, India.

Need for Social Cultural Values in Water Resources Development. Presented at the AAAS Conference on Environmental Sciences and International Development, December, 1971, Philadelphia, Pennsylvania, U.S.A.

Youth and Environment in Nepal. Background Paper for the International Youth Conference on the Human Environment, August, 1971, McMaster University, Hamilton, Ontario.

MARCIA M. GOWEN

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EDUCATION

- Ph.D. The Ohio State University (1983)
Agricultural Economics: Natural Resource Economics (Major)
Dissertation: Economics of Wood, Natural Gas, and Coal Fired
Boilers Under Alternative Land and Air Pollution
Standards: Three Ohio Cases
Major Advisor: Dr. Fredrick J. Hitzhusen
- M.S. The Ohio State University (1978)
Agricultural Economics: International Development (Major)
Thesis: Farm Household Market Participation in Taiwan 1960
to 1975
Thesis Advisor: Dr. Richard L. Meyer
- B.A. Smith College, Northampton, MA (1976)
Environmental Biology (Major)

Junior Year Exchange at Dartmouth College, Hanover, NH

Honors Gamma Sigma Delta, Phi Kappa Phi, East-West Center Fellowship

EXPERIENCE

September
1983 to
present:

Research Fellow, Resource Systems Institute, Pacific Energy
Program, East-West Center, Honolulu, Hawaii.

Publish solar/biomass energy resource, technology and economic
assessment manual with application to Pacific Region; conduct
economic analyses of photovoltaics in Cook Islands and Fiji;
work with rural electrification studies in PNG, Fiji, Cook
Islands, and Ponape; prepare benefit-cost computer programs for
biomass energy systems; coordinate and present energy training
materials for energy planners conference.

April to
September
1983:

Research Fellow, Resource Systems Institute, East-West Center,
Honolulu, Hawaii.

Prepared teaching materials for participatory action research in
Asia with international/interdisciplinary team; developed energy
computational manual for Pacific Region; attended UNPEP/SPEC
energy planners conference in Fiji; assisted class in using
benefit-cost computer program.

MARCIA M. GOWEN

January 1979 to March 1983: Ph.D Research Associate, Department of Agricultural Economics and Rural Sociology, The Ohio State University, Columbus, Ohio.

Researched sustainable wood energy supply, risk/uncertainty, user costs, and environmental uncertainty in project analysis; compared wood, natural gas, and coal-fired boiler economics; internalized shadow prices for maximum sustainable yields, land reclamation costs, and stricter air pollution standards into boiler economics.

Summer 1980: Research Assistant, Resource Policy Center, Thayer School of Engineering, Dartmouth College, Hanover, New Hampshire.

Analyzed environmental effects of gasohol industry; calculated sustainable wood energy potential in Northern New England.

July to December 1978: Post-Master's Full-Time Research Associate, Department of Agricultural Economics and Rural Sociology, The Ohio State University, Columbus, Ohio.

Estimated the international energy potential of agricultural crops and residues for the Office of Technology Assessment, U.S. Congress, Purdue University study.

September 1976 to June 1978: Master's Research Associate, Department of Agricultural Economics and Rural Sociology, The Ohio State University, Columbus, Ohio.

Compiled annotated bibliography on off-farm income, income distribution, off-farm labor supply; researched the effect of off-farm income on farm households participation in financial, consumer goods, labor, and farm product markets in Taiwan.

Teaching Experience: Invited Lectures - "Estimation of Environmental-Economic Linkages in Input/Output Analysis" and "Risk and Uncertainty in Project Analysis," graduate courses, Agricultural Economics and Rural Sociology Department, The Ohio State University.

PUBLICATIONS

Gowen, Marcia M. 1983. "Resource, Technology, and Economic Assessment of Energy Systems in the Pacific." Working paper, Pacific Islands Development Program, East-West Center, Honolulu, Hawaii. Forthcoming.

Gowen, Marcia and Fred Hitzhusen. 1983. "A Comparison of Wood, Natural Gas, and Coal-Fired Boiler Economics Under Alternative Pollution Standards in Ohio," Research Bulletin, Ohio Agricultural Research and Development Center and Department of Agricultural Economics and Rural Sociology, The Ohio State University. Forthcoming.

MARCIA M. GOWEN

- Gowen, Marcia. 1983. Economics of Wood, Natural Gas, and Coal-Fired Boilers Under Alternative Land and Air Pollution Standards: Three Ohio Cases, unpublished Ph.D. dissertation, March 1983, Department of Agricultural Economics and Rural Sociology, The Ohio State University.
- Hitzhusen, F.J., T. Bacon, T. Cathcart, and M. Gowen. 1983. "An Inventory of Ohio Biomass Resources," Ohio Report, March-April 1983, Ohio Agricultural Research and Development Center, Wooster, Ohio.
- Gowen, Marcia M. 1983. "Environmental Decision Criteria: Handling Environmental Pricing Uncertainty in Project Analysis," draft for USAID Title XII strengthening grant on project analysis, March 1983, The Ohio State University.
- Hitzhusen, F.J., T. Bacon, T. Cathcart, and M. Gowen. 1982. "Ohio Biomass for Energy: Annual Potential by County," ESPR-5, April 1982, Department of Agricultural Economics and Rural Sociology, The Ohio State University.
- Gowen, Marcia and George Morse. 1981. "Risk and Uncertainty in Project Analysis," ESO No. 1007, March 1981, Department of Agricultural Economics and Rural Sociology, The Ohio State University.
- High, Colin, Robin Wildermuth, and Marcia Gowen. 1981. Environmental Assessment of Biomass Energy Systems for Northern New England. Resource Policy Center, Thayer School of Engineering, Dartmouth College, DSD No. 314, October 1981.
- Gowen, Marcia M. and Richard L. Meyer. 1979. "Importance of Rural Markets in Taiwan's Development Strategy," ESO No. 648, September 1979, Department of Agricultural Economics and Rural Sociology, The Ohio State University.
- Rask, N., F. Hitzhusen, M. Gowen, and T. Cathcart. 1979. "International Potential of Agricultural Biomass for Energy," The Potential of Producing Energy from Agricultural Residues, Office of Technology Assessment, U.S. Congress, Draft Report, March 1979.
- Gowen, Marcia M. 1978. Farm Household Market Participation in Taiwan: 1960-1975, unpublished M.S. Thesis, July 1978, Department of Agricultural Economics and Rural Sociology, The Ohio State University.
- Meyer, R.L., et al. 1978. "Off-Farm Employment and Income of Rural Households: The Case of Taiwan and Korea," Final Report to AID, ESO No. 492, April 1978, Department of Agricultural Economics and Rural Sociology, The Ohio State University.
- Gowen, Marcia M., L. Buttel, and R.L. Meyer. 1977. "A Fortran Computer Program for Calculating the Gini Ratio for Ungrouped Data," ESO No. 446, December 1977, Department of Agricultural Economics and Rural Sociology, The Ohio State University.

MARCIA M. GOWEN

PRESENTED PAPERS

Hitzhusen, F., N. Rask, and M. Gowen. 1979. "Energy from Agriculture: Toward an Economic Research Agenda," discussion paper at IAAE meetings, September 3-12, 1979, Banff, Alberta, Canada.

Rask, N., F. Hitzhusen, and M. Gowen. 1978. "Energy from Agriculture: An Overview of the Food-Energy Interface," Symposium paper, AAEA meetings, August 7, 1978, Blacksburg, Virginia.

PROFESSIONAL AND OTHER ACTIVITIES

Memberships: American Agricultural Economics Association, American Economics Association, and Association of Environmental and Resource Economists.

Graduate Representative on Academic Affairs Committee (1979-1980) and Graduate Committee (1980-1981), Department of Agricultural Economics and Rural Sociology, The Ohio State University.

LANGUAGES

French: Eight years secondary education, one year in college, used while travelling in France and Europe.

RICHARD MORSE

Biographical Data

BIRTH: October 12, 1922, Boston, Massachusetts

FAMILY: Married Romola Thomas Chowdhry, Almora, India, 1949
Children A. Daniel Morse, 29, Sunita M. Kelly, 24

POSITION: Research Associate, East-West Center, Resource Systems Institute,
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EDUCATION

Harvard University, M.A. Economics, Ph.D. general examination, 1958
Columbia University Teachers College, Sociology, Summer 1950
Banaras Hindu University, Aligarh Muslim University, Gokhale Institute of
Politics and Economics, South Asia Studies, 1947
Dartmouth College, A.B. Economics, 1946

EMPLOYMENT EXPERIENCE

Research Associate, East-West Center, May 1974 to present
Senior International Economist, Stanford Research Institute, 1966-69
Consultant, Ministry of Industrial Development and Ford Foundation, India
1964-66
Industrial Economist, Stanford Research Institute, 1958-66; Consultant,
Banco Popular, Colombia, 1962; Ministry of Commerce and Industry,
India, 1958-60
Assistant to the Representative, The Ford Foundation, Burma, 1954-56
Special Assistant to the Chief of Mission and Education Officer, Economic
Cooperation Administration, Burma, 1950-53

BUSINESS EXPERIENCE

Consultant, South Asia Investment and Industrial Economics, 1969-74,
Andover, Massachusetts
Investment counselling: Medium scale venture development, United
States and South Asia
Applied research: Statistical clustering analysis of comparative
manufacturing advantage

PROFESSIONAL ACTIVITIES

Co-Coordinator, Energy for Rural Development, East-West Resource Systems
Institute with institutions in Bangladesh, India, Indonesia, Nepal,
Philippines. Sri Lanka. Thailand. and United States, 1978 to present

May 1984

Richard Morse

Farming systems resource person, College of Tropical Agriculture and Human Resources, University of Hawaii, 1981-82
 Visiting Professor, Appropriate Technology Development Association, Lucknow, and Indian Institute of Management, Ahmedabad, 1980-81
 Convenor, Hawaii program group, President's Commission on Foreign Language and International Studies, 1979
 Coordinator, Entrepreneurship Research and Development, East-West Technology and Development Institute with institutions in Hong Kong, India, Indonesia, Malaysia, New Zealand, Philippines, South Korea, and United States, 1974-77
 Consultant, African Small Enterprise Development, International Labour Organization, Abidjan, 1977
 Member, Resource Committee, Design of a National Development Finance System, Center for Community Economic Development, Cambridge, Massachusetts, 1975
 Chairman, Workshop Session on agricultural mechanization and indigenous production of agricultural machines, International Rice Research Institute, Philippines, May, 1975
 Study Director, National Academy of Sciences and National Academy of Engineering, Board on Science and Technology for International Development, Special International Panel on International Industrialization Institute, 1972-73
 Massachusetts Institute of Technology: Comparative analysis of industrial planning factors, 1971
 Stanford Research Institute, Regional development planning, Iran, 1971
 Development and Resources Corporation: Planning and assessment of small industry programs, Peace Corps, India, 1970
 Union Carbide Corporation, Oak Ridge National Laboratory: Nuclear power and irrigation complex, Middle East, 1969
 Coordinator, Stanford International Program in Small Industry Management, 1960-61
 Moderator, panel on ethnic minorities, Conference of Southeast Asia Universities, University of Rangoon, 1954

DIRECTORSHIPS AND ASSOCIATIONS

Chairman, Assembly of Research Associates, East-West Center, 1982-83
 Director, Kokokahi World Hunger Foundation
 Co-Founder and Director, Hawaii Entrepreneurship Training and Development Institute (HETADI), 1977 to present
 Chairman, Board of Governors, Institute of Current World Affairs, 1972-74;
 Member, Finance Committee, 1970-74
 Member, American Agricultural Economics Association, American Association for Asian Studies, American Economic Association, Nitrogen Fixing Tree Association, Society for International Development, Volunteers for International Technical Assistance

Richard Morse

SEMINARS

International Bank for Reconstruction and Development, 1977; East-West Center Food Institute, 1974, 1975; Massachusetts Institute of Technology, 1973; Institute of Developing Economies, Tokyo, 1972; Wheaton College, 1971; Indo-American Chamber of Commerce, Maharashtra Small Scale Industries Development corporation, and Baroda Productivity Council, 1970; Economic Development Institute, 1970; Stanford University, 1960, 1967-69; Michigan State University, 1954

LANGUAGES

Hindi: speak and read. Urdu: speak. Spanish: speak and read. French: read.

PUBLICATIONS AND REPORTS

Rural, Regional, and Employment Development

Rural Energy to Meet Development Needs: Asian Village Approaches. Westview Press, 1984. Co-editor and co-author.

Complementarity of Rural Energy and Farming Systems. Proc. Farming Systems Research Symposium, Kansas State University, November 1982.

Looking at Sugar's Future with Hilo Coast Growers. Hawaii Institute of Tropical Agriculture and Human Resources, May 1982. Team author.

Assessing Alternative Resources, Technologies, and Organizational Means for Meeting Rural Energy Needs. ERD Program Report 80-1. September 1980. With Fereidun Fesharaki. East-West Resource Systems Institute.

Energy for Rural Development Implementation Plan for Inter-Country Research Activities 1980-1983. April 1980. Team author. National Research Council of Thailand and East-West Resource Systems Institute.

Rural Policy Research to Meet Food, Employment, and Resource Allocation Needs. Discussion Paper. January 1979. East-West Resource Systems Institute. Team author.

Lokahi Pacific Corporation Overall Economic Development Plan, 1978-1983. February 1978. Hawaii Entrepreneurship Training and Development Institute. With George Kanahele and Gene R. Ward.

Responding to Technical Information Needs of Developing Countries: An Evaluative Review of the VITA International Inquiry Service. March 1972.

Richard Morse

Costs of Urban Infrastructure for Industry as Related to City Size in Developing Countries: India Case Study. 1968. Stanford Research Institute, School of Planning and Architecture, and Small Industry Extension Training Institute. With Om Prakash Mathur and M. C. K. Swamy.

Market Feasibility Report on Precision Seed-Fertilizer Drill, Punjab and Bihar. 1965.

Entrepreneurial and Small Enterprise Development

Entrepreneurial Discovery and Development: Progress of Action Research, September 1977; Entrepreneurial Development in Low-Income Communities: Research Plan and Working Proposals, July 1975. East-West Technology and Development Institute. Team author.

Entrepreneurial Initiatives and Community Need Fulfillment. In International Labour Office, Small Enterprise Development: - Policies and Programmes. Geneva 1977.

Entrepreneurial Initiatives in Asian Micro-Regions: A Key to Economic Take-off. June 1975. International Symposium on Entrepreneurship and Small Enterprise Development, Cincinnati, Ohio.

Entrepreneurship in Low-Income Societies: Program Concepts and Approaches. October 1973. East-West Technology and Development Institute.

Versatility and Success in Small Industry Development in India: Report to American Peace Corps. November 1970.

Modern Small Industry for Developing Countries. McGraw-Hill, 1965. With Eugene Staley.

Small and Medium Industry in Colombia's Development. 1962. Banco Popular and Stanford Research Institute. With Eugene Staley and Robert W. Davenport.

Land Tenure and Indian Society. 1950. Foreign Policy Bulletin.

Industrialization, Market Development, and Trade Policy

Entrepreneurial Pricing and Competitive Market Policies. November 1975. International Symposium on Small Business, Tokyo.

Meeting the Challenge of Industrialization: Proposal for an International Industrialization Institute. 1973. Panel Report. National Academy of Sciences and National Academy of Engineering. Principal author.

Richard Morse

A Development Finance Corporation for the Middle East. 1969. Stanford Research Institute. With Robert W. Davenport.

Corporate Strategy for XYZ Timber Company. 1962. Stanford Research Institute. With A. Kenneth Beggs and David I. Luck.

Small Business in the U.S. Electronics Industry. 1962. Stanford Research Institute. Technical editor.

An Economic Analysis of Imports as a Factor Affecting the U.S. Textile and Apparel Industries. 1961. Stanford Research Institute. With A. Kenneth Beggs, Carlton L. Wood, and Joseph E. Carrier.

Political Change and Federalism

The Place of Participatory Action Research in Development Policy. February 1984. East-West Center Development Forum. With Deepak Bajracharya and Varun Vidyarthi.

The Fourth Revolution. February 1975. Honolulu Advertiser.

Technology and the World Federal Question. 1973. Unpublished essay.

Democracy Divided. November 1971. Christian Science Monitor. See U.S. Role in South Asia, Congressional Record, November 5, 1972.

Freedom in World Affairs. 1968. Unpublished essay.

Burma's Domestic Recovery. 1953. Far Eastern Survey.

MILITARY SERVICE

United States Army, Technical Sergeant, India, Burma, China, 1943-45

AWARDS AND HONORS

Citation awards by Prime Minister of Burma, President, Burma Translation Society, and Ministry of National Planning, Burma, for cooperative program development, 1953 and 1956

Fellow, Harvard University, 1957-58; Ford Foundation, 1956-58

Fellow, Institute of Current World Affairs, 1946-1950

Valedictorian, Summa Cum Laude, Phi Beta Kappa, Dartmouth College, 1946

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Education:

Ph.D. (1977)--Biomedical and Environmental Health Sciences (Energy and Environment), University of California, Berkeley

M.P.H. (1972)--Environmental Health Sciences, University of California, Berkeley

B.A. (1968)--Physical Sciences (Physics and Astronomy), University of California, Berkeley

Fellowships and Awards:

1980, 1982, East-West Center Makana Awards for "Promoting Understanding and Better Relations Between East and West."

1975-1977, National Institutes of Health Research Support Grant

1974-1977, National Institutes of Health Fellowship

Research Interests:

The relationship between Health and Development in the Asia-Pacific Region, in particular the environmental health impacts of energy production and use; health risk analysis of alternative energy production technologies and their utility in policy making; the usefulness of adjusting energy production and use patterns for the purpose of rationalizing social and economic development plans; energy use as an indication of economic status and potential environmental stress; long-term impacts on human wellbeing through damage to environmental services from resource utilization.

Activities:

Session Chairman, Developing Country Experience, Third International Conference on Indoor Air Quality, Stockholm, 1984.

Session Chairman, Air Pollution, Fuel Chemistry Meeting, American Chemical Society, 1984.

Technical Advisory Committee on Indoor Air Pollution. U.S. Environmental Protection Agency, 1984.

Indoor Air Quality Committee TT-7 of Air Pollution Control Association, 1984.

Steering Committee, Asian Energy for Rural Development Program, 1980-1982.

Nuclear Risk Criteria Standards Committee of the Institute of Electrical and Electronic Engineers (IEEE/NPEC WG 5.4), 1980-84.

President, Hawaiian Chapter of the Health Physics Society, 1980-1981.

Radiological Health and Safety Advisory Committee, State of Hawaii, 1980-1981.

Board of Trustees, Federation of American Scientists, 1977-1981.

Governor's Inspection Team to Certify the Radiological Safety of Nuclear Spent Fuel Ships in Hawaiian Ports, 1979.

Technical Advisory Committee to the Presidential Task Force for Review of Nuclear Waste Management, 1978.

Energy Study Panel, National Council of Churches, 1977-1978.

Environmental Advisory Committee, California State Energy Resources Conservation and Development Commission, 1976-1977.

Energy Platform Committee, California Democratic Party, 1975-1976.

Board of Directors, Institute of Applied Ecology, 1973-1977.

Present Position:

Research Associate and Energy Program Leader,
East-West Resource Systems Institute
(1977 - present)

Responsibilities include:

- 1) Coordination of the Biomass Fuels, Air Pollution, and Health Project, a component of the East-West Center's Program in Human Health and Economic Development. This project involves laboratory, field, theoretical, and policy investigations in Hawaii, India, Nepal, and Thailand.
- 2) Program Development: Plan, seek funding for, coordinate, and evaluate seven concurrent projects:
 - a) Energy for Rural Development involving institutions in seven Asian countries.
 - b) Energy for Rural Development involving the first complete energy analyses of 10 Pacific Island countries.
 - c) OPEC Downstream involving evaluation and forecasting of changes in the international downstream petroleum market.
 - d) Energy Conservation Potential of Industries in Thailand, Bangladesh, and the Philippines.

- e) Electrical Futures of Asia involving evaluation and comparison of electric power systems in Northeast and Southeast Asia.
 - f) Biomass Fuels, Air Pollution, and Health (see above).
 - g) Graduate-level academic energy program jointly with the University of Hawaii.
- 3) Budgeting: Plan, administer, and monitor a half million dollar budget.
 - 4) Personnel Management: Advise in the selection and evaluation of research staff (10-12) and hire, supervise, and evaluate ten support staff.

Employment:

- 1976 American Physical Society, Nuclear Fuel Cycle Study, Consultant on hazard indices.
 - 1974-1975 Energy and Resources Group, U.C. Berkeley, Postgraduate Researcher.
 - 1974 U.S. Cultural and Scientific Exchange Program: Romania, Consultant and lecturer in environmental health and energy.
 - 1973-1974 U.S. Cultural and Scientific Exchange Program: Yugoslavia, Expert and lecturer in science education or environmental health (three separate trips).
 - 1973 State of California Seismic risk consultant and conference coordinator.
 - 1971-1972 U.S. Cultural and Scientific Exchange Program: Poland and USSR, Expert and lecturer in science education.
 - 1969 Lawrence Hall of Science, U.C. Berkeley, Staff member, lecturer and researcher in science education.
 - 1969 Radio Astronomy Laboratory, U.C. Berkeley, Research Assistant.
- Various short-term consultantships and over one hundred lectures, short courses, or conferences in the U.S. or the Asia-Pacific Region on energy, risk analysis, or environmental health sciences.

Teaching:

Coordinator, Joint UH-EWC Graduate Program in Energy Planning, Economics, and Policy.

Graduate Geography courses in Resource Systems at the University of Hawaii.

Member of thesis and dissertation committees in several departments at the University of Hawaii. Chairman of dissertations in Geography Department.

Energy, decision-analysis, or environmental effects portions of more than twenty different graduate or undergraduate courses in ten different departments at U.C. Berkeley and University of Hawaii.

Lecturer at the Fourth International Summer College on Physics and Contemporary Needs, Nathiagali, Pakistan, 1979 and Summer Institute of World Energy and Development, Institute of World Affairs, Salisbury, Connecticut, 1982 and 1983.

One course each of basic science to primary students, astronomy to junior high students, and astronomy to junior college and high school teachers.

Professional Societies:

Health Physics Society (Hawaiian and National Chapters)
 Air Pollution Control Association
 American Nuclear Society
 American Public Health Association
 Federation of American Scientists
 American Association for the Advancement of Science

Personal:

Work or travel in more than one hundred countries in East and West Europe, the Middle East, Asia, Australasia, the South Pacific, and the Western Hemisphere with particular emphasis on the Asia-Pacific Region.

Licensed pilot and scuba diver

Dissertation:

"The Interaction of Time and Technology: Propositions Suggested by an Examination of Coal and Nuclear Power, Hazard Indices, the Temporal Judgments of Law and Economics, and the Place of Time in Mind and Myth," University of California, Berkeley, 1977.

Book:

Smith, K. R. with other members of the RSI Energy Program, Critical Energy Issues in Asia and the Pacific: The Next Twenty Years, Westview Press, Boulder, Colorado. 1982.

Books in Preparation:

Ehrlich, P. and A., J. P. Holdren and K. R. Smith, Introduction to Ecoscience, W. H. Freeman, San Francisco (University textbook).

Smith, K. R., senior author, with other members of the International Rural Biomass Fuels and Air Pollution Project, Rural Biomass Fuels, Air Pollution, and Health: A Global Review, World Health Organization, Geneva, Switzerland.

Smith, K. R., F. Fesharaki, and J. P. Holdren (eds.) Earth, Planets, and Cosmos: Essays in Honor of Harrison Brown, Westview Press, Boulder, Colorado.

Articles, Chapters, and Reports:

Armstrong, D. and K. R. Smith (editors), Tri-Cities Seismic Safety and Environmental Resources Study, Calif. Council on Intergovernmental Relations and the U.S. Department of Health, Education and Welfare, 1973.

Smith, K. R., "The Application of Seismic Risk Analysis to Land Use Decisions," Chapter 11 of Tri-Cities Study (above).

Smith, K. R., "The Age of Enlightenment Ends," Journal of Irreproducible Results, 20, 27-29, June 1973.

Smith, K. R., J. Weyant and J. P. Holdren, Evaluation of Conventional Power systems: Economic, Environmental and Resource Impacts, Energy and Resources Report, ERG 75-5, U.C. Berkeley, 1975. Also published by the Jet Propulsion Laboratory, Pasadena, California, 1976.

Smith, K. R., "Habitat: United Nations Conference on Human Settlements," Federation of American Scientists Public Interest Report, 29, 6-7, Sept. 1976.

Smith, K. R., and D. Cudaback, "A Teaching Lab in Radio Astronomy," Science Education, 60, 463-469, 1976.

Smith, K. R., "The Coal-Uranium Breeder: Uranium From Coal," Energy, the International Journal, 2, 171-177, June 1977.

Smith, K. R., "What Has the Future Done for Us," Uniquist 8, 12-14, 1977.

Smith, K. R., "Biogas-Powered Piggery in the Philippines," Soft Energy Notes, 1, 45-46, 1978.

Smith, K. R., "Military Uses of Uranium: Keeping the U.S. Energy Accounts," Science 201, 609-611, 18 August 1978. Also presented in a seminar at the Centre for Strategic and International Studies, Jakarta, Indonesia, May 1978.

Smith, K. R., ed., Report on the Asia-Pacific Energy Studies Conference, East-West Resource Systems Institute, Honolulu, Hawaii, 1978.

- Holdren, J. P., K. Anderson, P. H. Gleick, I. Mintzer, G. Morris, and K. R. Smith, Risk of Renewable Energy Sources: A Critique of the Inhaber Report, Report ERG-79-3, Energy and Resources Group, University of California, Berkeley, June 1979.
- Brown, H., K. R. Smith and F. Burian, Report on the Asia-Pacific Energy Studies Consortium Planning Workshop II, East-West Resource Systems Institute, Honolulu, 1979.
- Smith, K. R., "Nuclear Waste Characteristics," in Physics and Contemporary Needs, pp. 55-68, Riazuddin (ed.) Plenum Press, New York, 1980.
- Smith, K. R., "Environmental Impacts of Renewable Energy Sources: Methodological Issues," in Physics and Contemporary Needs, pp. 69-78, Riazuddin (ed.) Plenum Press, New York, 1980.
- Smith, K. R., "Carbide Fuel Cycles: A Mixture of Solar Energy and Coal," Energy Sources 5(3), 223-246, 1980.
- Brown, H. and K. R. Smith, "Energy in the Asia-Pacific Region," Annual Review of Energy, 5, 173-240, 1980.
- Smith, K. R., and M. Valencia, "Whither Asia's Nuclear Waste," Perspectives 1(3), 11-16, Spring 1980.
- Smith, K. R. and H. Brown, "From Pakistan to Japan: the Energy Problems of Asia," OPEC Review, 4(3), 19-54, 1980.
- Smith, K. R. and M. T. Santerre, Criteria for Evaluating Small-Scale Energy Technologies: the FLERT Approach, ERD PR-80-4, East-West Resource Systems Institute, East-West Center, Honolulu, 1980.
- Santerre, M. T. and K. R. Smith, Application of the FLERT Approach to Rural Household and Community Anaerobic Digestion Systems, ERD PR-80-5, East-West Resource Systems Institute, East-West Center, Honolulu, 1980.
- Santerre, M. T. and K. R. Smith, "Measures of Appropriateness: The Resource Requirements of Anaerobic Digestion (Biogas) Systems," World Development 10(3)239-261, 1982.
- Smith, K. R. "Nuclear Power in the Asia-Pacific Region" Chapter 4 of Critical Energy Issues (book listed above).
- Smith, K. R. et al. "Energy in the Asia-Pacific region: the Most Important Questions" Chapter 7 of Critical Energy Issues (book listed above).
- Smith, K. R. and C. Colfer, "Cooks on the World Stage: The Forgotten Actresses/Actors," Working Paper WP-83-5, RSI, 1983. Submitted for publication.

Aggarwal, A. L., R. M. Dave, and K. R. Smith. "Air Pollution and Rural Biomass Fuels in Developing Countries. Feature Article in Abstracts of Selected Solar Energy Technology (ASSET), 5(4):18-24, April 1983.

Smith, K. R., A. L. Aggarwal, and R. M. Dave, "Air Pollution and Rural Biomass Fuels in Developing Countries: A Pilot Village Study in India and Implications for Research and Policy," Atmospheric Environment, 17(11):2343-2362, 1983.

Invited Conference Papers
in Published Proceedings:

Smith, K. R., "Environmental Health and Coal Energy: Six Criticisms of the National Plan," Proceedings of ERDA Conference on the National Energy Plan, Sept. 1976.

Brown, H. and K. R. Smith, "Energy Problems of the Asia-Pacific," East-West Parliamentarians' Conference (keynote paper), East-West Center, Honolulu, Hawaii, Dec. 1978.

Smith, K. R., "Problems of Secondary Accounting: The Poor Example of Risk Analysis." Proceedings of the Joint IIASA-RSI Conference on Systems Aspects of Energy and Mineral Resources, International Institute of Applied Systems Analysis, Laxenburg, Austria, July 1979.

Smith, K. R., "The U.S. and Nuclear Nonproliferation: Invited Comments." Workshop on Nuclear Energy Use and Supply in the Pacific, Australian National University, Canberra, March 1980.

Smith, K. R., "Risk Analysis: Toward a Standard Method." American/European Nuclear Societies' Thermal Reactor Safety Meeting, April 1980.

Smith, K. R., "Energy Supply and Demand in Southeast Asia: Trade Implications of Present Trends and Projections." (Keynote Paper) Proceedings of the Shipping, Energy, and Environment Workshop, East-West Environment and Policy Institute, Honolulu, Dec. 1980.

Smith, K. R., J. Ramakrishna, and Premalata Menon, "Air Pollution From the Combustion of Traditional Fuels: A Brief Survey." Conference on Air Quality Management and Energy Policies of the East-West Environment and Policy Institute and J. Nehru University, held in Baroda and Bombay, India, 1981. Also RSI Working Paper No. WP-81-5.

Brown, Harrison, Guy Pauker, and Kirk R. Smith, "Energy in the Asia-Pacific Region." Background paper for the First Asia-Pacific Energy Studies Conference, East-West Center, July 1978. Published in Energy, the International Journal 6(8),649-658, 1981.

Smith, K. R. "Overview of the Non-Renewable Energy Resources of the Asia-Pacific Region" International Conference on Energy, Institute of Energy, Sydney, Australia, November, 1981.

- S. Babu, C. Siddayao, and K. R. Smith, "The Future of Gas, Natural and Synthetic," Asia-Pacific Energy Studies Consultative Group Conference V, May 1982, East-West Center. (Energy, the International Journal, in press.)
- Ramakrishna, J. and K. R. Smith, "Smoke from Cooking Fires: A Case for the Participation of Rural Women in Development Planning," Conference on Women's Studies in Different Cultural Contexts, University of Hawaii/East-West Center, November 1982. Also RSI Working Paper WP-82-20.
- Dollar, A. M., P. Menon, and K. R. Smith, "Women's Health and Exposure to Air Pollution from Cooking Fuels," *ibid.*
- Van Dyke, J., K. R. Smith, and S. Siwatibau, "Nuclear Activities and the Pacific Islanders," Nuclear Electric Power Conference, East-West Center, Honolulu, January 1983. (Energy, the International Journal, in press.)
- Smith, K. R., "Village Cooks and Indoor Air Pollution: The Dark Side of Small is Beautiful," Air Pollution Control Association 76th Annual Conference, Atlanta, Georgia, June 1983.
- Smith, K. R., "Village Cooks and Air Pollution: The Dark and Bright Sides of Small is Beautiful." UNESCO sponsored workshop Biomass Energy Management in Rural Areas. Administrative Staff College of India, Hyderabad, December 1983.
- Kim, Y. H. and K. R. Smith, "Electric Power and Development: The Case of Northeast Asia." Annual Conference of the International Association of Energy Economists, New Delhi, India, January 1984.
- Smith, K. R., M. Apte, P. Menon, and M. Shrestha, "Carbon Monoxide and Particulates from Cooking Stoves: Results from a Simulated Village Kitchen." Third International Conference on Indoor Air Quality, August 1984.

Letters to Editors of
Technical Journals:

- Smith, K. R., "Plutonium Hazards Revisited," Nuclear News 18 31, Nov. 1975.
- Holdren, J. P., K. R. Smith and G. Morris, "Energy: Calculating the Risks," Science 204, 564-568, 11 May 1979.
- Smith, K. R., "The Right to Take Risks," American Scientist, 67, 267, May-June 1979.

Reviews:

- How to Obtain Cheap Abundant Energy by L. B. McGown and J. O'M. Bockris in Science Books and Films 16(4) 1981.

Entropy: A New World View by Jeremy Rifkin in Technological Forecasting and Social Change, 20, 369-374, 1981.

"Oceanology: Energy Search Beneath the Seas" by Science Screen Report, Inc. in Science Books and Films 18(1), 1982.

The Gasohol Handbook by V. Daniel Hunt in Science Books and Films 18(3), 1983.

"Comparative Risks from Different Energy Systems--Evolution of the Methods of Studies" by Leonard Hamilton in Risk Abstracts (1)(3), 1984.

Other:

"Tom Schwarz in the Universe: A Photographic Essay on Where We Stand," 1974.

Four Films on Energy for Secondary Students, (Technical consultant and editor), Dimension Films, Los Angeles, California, 1976.

"S. ly Dying Embers--Radioactive Waste and the Pacific". Half-hour documentary (Executive Producer and Writer) East-West Center. Distributed nationally in the USA by the Public Broadcasting System, October 1982.

"Academic Energy Programs at the Post-Baccalaureate Level: A Global Survey," (with C. Lowry) East-West Resource Systems Institute, Technical Memorandum 83-1, 1983.

Reviewer for:

Bioscience

Nuclear Safety

Science

Council on Environmental Quality
International Institute for Applied
Systems Analysis
National Science Foundation
Resources for the Future
World Bank

CURRICULUM VITAE

PERSONAL DATA

Name: NAPOLEON T. VERGARA
Born: February 29, 1932; Mangataram, Pangasinan, Philippines
Sex: Male
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Citizenship: Filipino

MAILING ADDRESS

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ACADEMIC BACKGROUND

Ranger's Certificate, University of the Philippines at Los Baños, 1952
B.Sc. Forestry, University of the Philippines at Los Baños, 1954
M. Forestry, State University of New York at Syracuse, 1960

ACADEMIC HONORS AND SCHOLARSHIPS

Valedictorian, Mangataram High School, 1950
Entrance Scholar, University of the Philippines at Los Baños, 1950
College Scholar, University of the Philippines at Los Baños, 1951
Sta. Clara Lumber Co. Scholar, University of the Philippines at Los Baños, 1952-54
Elected to the Zeta Beta Rho Honor Fraternity in Forestry, University of the Philippines at Los Baños, 1954
US/ICA Graduate Fellow, State University of New York at Syracuse, 1958-60
Elected to the Gamma Sigma Delta Honor Fraternity in Agriculture, University of the Philippines at Los Baños, 1966

PROFESSIONAL EXPERIENCE

Junior Company Forester, Sta. Clara Lumber Co., Davao, Philippines, 1954
Instructor in Forestry, University of the Philippines at Los Baños, 1955-61
Assistant Professor of Forestry Economics, University of the Philippines at Los Baños, 1962-67
Associate Professor of Forestry Economics and Policy, University of the Philippines at Los Baños, 1968-July 1975

Lecturer in Forestry Economics and Management, University of Technology, Papua New Guinea, July 1975-December 1976
 Senior Lecturer in Forestry Economics and Management, University of Technology, Papua New Guinea, January 1977-December 1980
 Research Associate, Environment and Policy Institute, East-West Center, Honolulu, Hawaii, USA, January 1981 to Present

SPECIAL TOPICAL INTERESTS

Economics of forestry plantations for short rotation products (fuelwood, pulpwood, small timber).
 Social forestry/Community forestry/Agroforestry integrated land use systems as strategies for stabilization of fragile upland ecosystems, perpetuation of productivity, and promotion of rural development.

ADMINISTRATIVE/MANAGEMENT EXPERIENCE

Project Leader, Kaingin (Shifting Cultivation) Research Project of the University of the Philippines at Los Baños and the National Science Development Board, 1962-63
 Department Chairman, Department of Forest Resources Management, University of the Philippines at Los Baños, 1965-67
 Department Chairman, Department of Forestry Extension and Education, University of the Philippines at Los Baños, 1967-69
 Editor, University of the Philippines Forestry Alumni Newsletter, 1969-75
 Vice President, Philippine Forest Research Society, 1968
 President, Philippine Forest Research Society, 1969
 Editor, Philippine Forest Research Society Newsletter, 1974
 Acting Department Head, Department of Forestry, University of Technology, Papua New Guinea, February 1979-February 1980

GOVERNMENT CONSULTANCY

Presidential Economic Staff, Office of the President of the Philippines, 1966-71
Tasks: Assisted in the development of policies to promote growth of the forestry sector and enhance equitable distribution of benefits among rural populations.
 Department of Agriculture and Natural Resources (now separated into two ministries), 1971-72
Tasks: Participated in drawing up approaches to sustained yield forestry through improved extraction techniques and firm enforcement of rules.
 Bureau of Forest Development, Philippines, 1972-73
Tasks: Participated in drafting implementing rules to execute forest policies.
 National Economic and Development Authority, 1972-75
Tasks: The same as in the Presidential Economic Staff, which was integrated with NEDA in 1972.

Presidential Committee on Wood Industries Development, 1973-74

Tasks: Helped formulate plans for dispersal of forest-based industries for equitable regional distribution of economic benefits.

Philippine Council for Agricultural and Resources Research, 1974-75.

Tasks: Participated in the identification and prioritization of forestry research to promote rural and industrial development.

INDUSTRIAL CONSULTANCY

Sycip, Gorres, Velayo and Co. (Management and Accounting firm) 1970-75

Tasks: Provided the forestry expertise to multidisciplinary teams that analyzed and solved operational problems of client firms in the Philippines, Indonesia, Malaysia and Thailand.

Asian Development Bank (through Sycip, Gorres, Velayo and Arthur D. Little) 1970

Tasks: Participated in determining the transport requirements of the wood export trade of the Southeast Asian countries (Indonesia, Malaysia, Thailand, Laos, Vietnam, and the Philippines).

Cellophil Resources Corporation, 1974-75

Tasks: Assisted in corporate planning regarding resource base expansion, processing plant location, and staff development.

INTERNATIONAL CONFERENCES, SEMINARS AND WORKSHOPS

Participant, 11th Pacific Science Congress, Tokyo, Japan, 1966.

Presented a paper on shifting cultivation in the Southern Philippines.

Resource Person, International Farm Youth Exchange Seminar, Los Banos, Laguna, Philippines, 1978.

Participant, UN/ECE Study tour of Russian wood-based industries in Moscow and Leningrad, June 1969.

Member, ADB/SGV/ADL Team which carried out the survey of Southeast Asia Regional Transport requirements (Indonesia, Malaysia, Philippines, Thailand, Laos and Vietnam), 1970.

Member, SEARCA/University of the Philippines Team which surveyed the potential postwar forestry development of South Vietnam, 1970.

Member, Papua New Guinea Delegation to the 8th World Forestry Congress, Jakarta, Indonesia, 1978.

Resource Person, Regional Workshop on Human Ecology Research for Social Scientists, Honolulu, Hawaii, USA, June 1981.

Coordinator and Resource Person, Regional Workshop on Agroforestry and Fuelwood Production, Honolulu, Hawaii, USA, November, 1981.

Co-Chairman & Resource Person, East-West Center/Philippine Ministry of Human Settlements Training Seminar on Agroforestry for agricultural extension officers, Cebu, Philippines, June 1982.

Co-Chairman & Resource Person, East-West Center/Philippines Bureau of Forest Development Training Seminar on Agroforestry for forestry extension officers, Cebu, Philippines, July 1982.

Co-Chairman & Resource Person, East-West Center/Papua New Guinea Office of Forests Training Seminar on Agroforestry for extension foresters, Wau, Papua New Guinea, February 1983.

Co-Chairman, Asia-Pacific Regional Workshop for Forestry Research Directors. Honolulu, Hawaii. August, 1982.

Co-Coordinator & Resource Person, FAO/East-West Center Regional Workshop on Community Forestry, Korat, Thailand, August 1983.
Resource Speaker, First ASEAN Forestry Congress, Manila, Philippines, October 1983.

Resource Person, US Peace Corps Regional Inservice Training on Agroforestry for Peace Corps Volunteers & Host Country counterparts, Honiara, Solomon Islands, October 1983.

Participant, DSE-sponsored Conference of Agroforestry in the Pacific area, Suva, Fiji, December 1983.

MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS

Los Banos Biological Club, Philippines
International Society of Tropical Foresters
Society of Filipino Foresters
Philippine Forest Research Society
Papua New Guinea Biological Society
Commonwealth Forestry Association (until December, 1981)
Nitrogen Fixing Tree Association, Hawaii, USA

LIST OF PUBLICATIONS

1. "The kaingin problem: proposals for its solution" Forestry Leaves Vol. 13, No. 1, 1961, Los Baños, Philippines.
2. "The kaingin problem in Davao" Phil. Lumberman Vol. 8, No. 1, Dec. 61 - Jan. 62, Manila, Philippines.
3. "Let's revise our timber sales system" Phil. Lumberman Vol 11, Dec. 64 - Jan. 65, Manila, Philippines.
4. "The proposed ban on log exports" Phil. Lumberman Vol. 12, April-May, 1966, Manila, Philippines.
5. "Socio-Economic aspects of shifting agriculture in the Southern Philippines". Paper presented at the 11th Pacific Science Congress, Tokyo, Japan, 1966.
6. "Kaingin control" Phil. Lumberman Vol. 13, July, 1967, Manila, Philippines.
7. "Forestry extension and education in the Philippines" Phil. Forests Vol. 2, No. 2, March 1968, Manila, Philippines.
8. "The Role of 4-H Clubs in forest conservation" Published in the Proceedings of the International Farm Youth Exchange Seminar for Rural Youth Leaders, 1968, Los Baños, Philippines,
9. "Forest taxation and forest management" Tropical Forests & Industries March-April 1969, Manila, Philippines.
10. "Filipino Forester's impressions about Russia" Phil. Forests Vol. 3, No. 2, Sept. 1969, Manila, Philippines.

11. "Brownouts, vegetable farming and logging operations in the Mountain Province" Tropical forestry & Industries Vol. 1, No. 2, May-June 1969, Manila, Philippines.
12. "Forestry extension and forest conservation" Tropical Forests & Industries Vol. 1, No. 4, Oct. 1969, Manila, Philippines.
13. "The environment and utilization of natural resources" Reforestation Monthly Sept. 1971, Quezon City, Philippines.
14. "The impact of natural resource utilization on the environment" Phil. Forests Vol. 2-3, Sept. 1971, Manila, Philippines.
15. "The socio-economic importance of forests" Conservation Circular Vol. 8, No. 12, Dec. 1972, Los Baños, Philippines.
16. "Progress and environmental decay" Forestry Digest Vol. 1, No. 1, Sept.-Dec. 1972, Los Baños, Philippines.
17. "Philippine forest resources: their economic and strategic values" Conservation Circular Vol. 9, No. 4, April 1973, Los Baños, Philippines.
18. "The development of forestry extension in the Philippines" Phil. Forests 25th Anniversary Issue Sept. 1973, Manila, Philippines.
19. "Forest conservation: a joint responsibility" Conservation Circular Vol. X, No. 7, July 1974, Los Baños, Philippines.
20. "The effects of the log export ban analyzed" DataFil Vol. 1, No. 8, Oct. 1974, Manila, Philippines.
21. "Shifting agriculture: analysis and control" Paper presented during the Waigani Seminar, University of Technology, Lae, Papua New Guinea, May 1976.
22. "Investors in PNG beset by land-ownership conflicts" Journal of the ASPNG Vol. VI, No. 2, June 1976, Lae, Papua New Guinea.
23. "Land ownership problems in PNG" Commonwealth Surveying & Land Economy No. 4, Jan. 1977, London, England.
24. "Public problems of private forestry: the PNG case" Paper presented during a seminar at the University of the Philippines, Los Baños, Philippines, January 1977.
25. "The influence of forest land-tenure systems on environmental management in Southeast Asia" Paper presented before the South Pacific Commission Workshop on Environmental Planning and Assessment. Feb. 10, 1978. Lae, Papua New Guinea.
26. "Constraints on the development of lowland forest zones in Papua New Guinea" Paper presented before the Papua New Guinea Botanical Society Symposium on Lowland Rain Forests, June 7-8, 1980, Lae, Papua New Guinea.

27. "Natural vs. plantation forests: a policy problem with special reference to Papua New Guinea" Paper read at the East-West Center, 15 July 1980, Honolulu, Hawaii, U.S.A.
28. "Integral agroforestry: a potential strategy for stabilizing shifting cultivation and sustaining productivity of natural environment". Working Paper presented at the Regional Workshop on Human Ecology Research for Social Scientists, May-June 1981, East-West Center, Honolulu, Hawaii, U.S.A.
29. "Sustained yields from stabilized upland ecosystems: the role of legume trees in agroforestry" Presented at the Regional Workshop on Environmentally-Sustainable Agroforestry and Fuelwood Production, Nov. 1981, East-West Center, Honolulu, Hawaii, U.S.A.
30. "Integrated Agroforestry for Sustained Productivity".
 Part I. Canopy. Vol. 8, No. 3, March 1982
 Part II. Canopy. Vol. 8, No. 5, May 1982
 Part III. Canopy. Vol. 8, No. 7, July 1982
 Part IV. Canopy. Vol. 8, No. 8, August 1982
 College, Laguna, Philippines.
31. Editor: "New Directions in Agroforestry: The Potentials of Tropical Legume Trees." (5-piece extension package on Legume-tree based agroforestry):
- (a) Improving Agroforestry in the Asia-Pacific tropics
 - (b) Selection of Legume trees for agroforestry
 - (c) Sustained outputs from Legume-tree based agroforestry systems.
 - (d) Initial tasks in agroforestry projects
 - (e) Economic evaluation of agroforestry projects.
- June 1982, East-West Center, Honolulu, Hawaii, USA
32. "Agroforestry Systems Under Community Forestry: Concept, Classification and Current Use in the Humid Tropics". Paper presented at the EWC/FAO Regional Workshop on Community Forestry, August 1983. Korat, Thailand.
33. "Community Forestry for Soil Conservation and Improvement" Paper presented at the EWC/FAO Regional Workshop on Community Forestry, August 1982. Korat, Thailand.
34. "Making Fragile Uplands Stable with Agroforestry". Klinkii, Journal of the Forestry Society, Papua New Guinea (In Press).
35. "Some Roles of Agroforestry in the Pacific Region". Paper presented at the Pacific Workshop on Agroforestry sponsored by the German Foundation for International Development (DSE). December 1983. Suva, Fiji.