RWEDP Report No. 41

REGIONAL WOOD ENERGY DEVELOPMENT PROGRAMME IN ASIA
GCP/RAS/154/NET

WOODFUEL IN THE PHILIPPINES

- PRODUCTION AND MARKETING -

Techer's Camp, Baguio City, PHILIPPINES

19 - 31 July 1997

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
Bangkok, August 1998

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FOREWORD

The production and marketing of woodfuels depend on a variety of conditions which can differ substantially throughout the regions of Asia. These include the local characteristics of landuse systems, the state of the rural socio-economy, employment and fuel markets, as well as national policies and practices with regard to energy, forestry, agriculture, environment, etc. However, what is common in most countries is the overall importance of woodfuel production and marketing in income generation and in meeting the daily fuel needs of rural people.

What is also common in most countries throughout Asia is that woodfuel production can be developed by better integration of trees into farming systems, and that woodfuel marketing can be facilitated by unhindered flows of woodfuels raised in non-forest lands. It is generally observed that adopting these two main principles works to the benefit of both suppliers and users of woodfuels, as well as the local environment.

The training workshop in Baguio reviewed these issues and several other important aspects of the production and marketing of woodfuels. I would like to congratulate our colleagues from the Forest Management Bureau of the Department of Environment and Natural Resources in the Philippines, for successfully conducting the workshop. Thanks are also due to Mr. Tara Bhattarai, Wood Energy Resources Specialist at RWEDP, for assisting in the preparation and implementation of the workshop.

Dr. W.S. Hulscher
Chief Technical Adviser
FAO/RWEDP

PREFACE

This publication contains the report on the National Training Workshop on Integrating Woodfuel Production and Marketing in Forest, Agriculture and Tree Production Systems held in Baguio City, Philippines from 29-31 July 1997.

The report includes the following pertinent information on the training workshop: a) an overview of the training workshop; b) details of the training methods used; c) summaries and the full text of the papers presented; d) a summary of the field trip; e) conclusions and recommendations that arose from the workshop; and f) various appendices giving details of the attendees etc.

On behalf of the Forest Management Bureau of the Department of Environment and Natural Resources (FMB-DENR) of the Republic of the Philippines and the Food and Agriculture Organization's Regional Wood Energy Development Programme (FAO-RWEDP), our collaborator in the endeavor, an expression of gratitude is extended to everyone who made this worthwhile activity possible.

Jose D. Malvas, Jr.
Director

ABBREVIATIONS AND ACRONYMS

ANEC	-	Affiliated Non-Conventional Energy Centers
BSU	-	Benguet State University
BUN	-	Biomass Users Network
CAR	-	Cordillera Administrative Region
CBFMA	-	Community-based Forest Management Agreement
Cu m	-	Cubic Meter
DAP	-	Development Academy of the Philippines
DENR	-	Department of Environment and Natural Resources
DMMSU	-	Don Mariano Marcos State University
DOE	-	Department of Energy
FAO	-	Food and Agriculture Organization
FMB	-	Forest Management Bureau
FPRDI	-	Forest Products Research Development Institute
IEC	-	Information and Education Campaign
IFMA	-	Industrial Forest Management Agreement
ITPA	-	Industrial Tree Plantation Agreement
LKS	-	Lesser-known Species
LPG	-	Liquefied Petroleum Gas
MPFD	-	Master Plan for Forestry Development
NCED	-	Non-Conventional Energy Division
NCRD	-	Non-Conventional Research Division
NTA	-	National Tobacco Administration
OEA	-	Office of Energy Affairs
PCTs	-	Potential Crop Trees
PHES	-	Philippine Household Energy Strategy
PO	-	People’s Organization
RED	-	Regional Executive Director
RWEDP	-	Regional Wood Energy Development Programme
TA	-	Technical Assistant
TLA	-	Timber License Agreement
TSI	-	Timber Stand Improvement
TSP	-	Total Suspended Particulates
UPLB-FDC	-	University of the Philippines-Forestry Development Center

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PART I. OVERVIEW OF THE WORKSHOP

1. Background

The National Training Workshop on Integrating Woodfuel Production and Marketing in Forest, Agriculture and Tree Production Systems is a follow-up activity to the first sub-regional training workshop, entitled “Integrating Woodfuel Production into Agroforestry Extension Programmes” held in Bogor, West Java, Indonesia in April 1995.

This sub-regional activity was organized by RWEDP with the aim of enhancing the understanding of participants from its - at that time - eight member countries about the role of, and the positive contribution that could be derived from, integrating woodfuel production into their agroforestry extension programmes. It was during this training workshop that it was suggested that the Philippines should organize a similar activity to further disseminate, at the national level, the knowledge acquired at the sub-regional workshop to relevant government, non-government and private sector organizations. The Philippines was selected by the RWEDP to organize the national training workshop because traditional woodfuels play a major role in the energy situation of the country. Woodfuels still accounted for 382 peta joules (or 33%) out of a total 1,169-peta joules energy consumption in 1993. Furthermore, there is no indication that this consumption will be reduced in the future despite a continuing growth in commercial energy consumption.

It is in this context that the Department of Environment and Natural Resources of the Philippines through the Forest Management Bureau in collaboration with the RWEDP/FAO organized the National Training Workshop on Integrating Woodfuel Production and Marketing in Forest, Agriculture and Tree Production Systems.

2. Objectives

The activity was designed to increase the awareness of government, non-government and private sector organizations about the role of agroforestry systems in woodfuel production. Further, it also aimed to enhance the knowledge and capabilities of technical personnel to plan and implement programmes that could encourage farmers to integrate trees into farming systems and help generate additional income from their involvement in wood energy development.

Specifically, the training workshop aimed to achieve the following: 1) establish networks consisting of government organizations and non-government organizations that are, or are likely to be, contributing to the production, distribution and marketing of woodfuels in different parts of the country; 2) enhance their knowledge and understanding about the role of woodfuel in the national economy/rural socio-economy, including income and employment generation, methods of production and marketing from both forest and non forest sources, and identify strategies which could enhance production and promote the unhindered flow and utilization of woodfuels raised in non-forest lands; 3) formulate and implement integrated wood energy development programmes that will lead to sustained land use practices; and 4) contribute to the enhancement of institutional capabilities to plan and implement training courses that will promote the integration of trees and other woody perennials into the farming system.

3. Training Methods and Techniques

The training workshop was structured as a three days training activity for thirty participants. The methods that were used include: 1) classroom lectures given by resource speakers; 2) presentation of case studies; 3) a field trip; 4) group discussions and workshops; and 5) presentation of group outputs.

4. Venue and Duration

The training workshop was held in the Teachers' Camp in Baguio City, Philippines from July 29-31, 1997.

5. Trainees

The training workshop was attended by twenty-four participants composed of technical personnel from DENR central and field offices, academic institutions and other government agencies. The participants had at least a considerable background in forestry and/or an energy-related discipline. The list of participants is attached as Appendix 1.

6. Resource Persons

Except for the speaker from FAO-Regional Wood Energy Development Programme (RWEDP), all other resource speakers were locally based. These included representatives from the DENR, DOE, FMB, BSU, and DMMSU. The list of speakers is presented in Appendix 1.

7. Opening Program

Welcome Address

The welcome address was delivered by Mr. Oscar Hamada, the Regional Executive Director (RED) of the DENR-CAR. Mr. Hamada first provided some brief information on the Cordillera Region, particularly on the history of Baguio City and its ability to recover from previous calamities. He also cited the environmental importance of the region as the location of the headwaters of nine major river systems supplying water not only to the Cordilleras but also to three other regions of the country.

Mr. Hamada thanked the organizers and sponsors of the National Training Workshop for choosing Baguio City as its venue. He mentioned the relevance and timeliness of the activity for the Philippines as it was organized in the wake of the recent currency devaluation which would mean increased oil prices and greater reliance on fuelwood as a source of energy.

In conclusion, he expressed confidence in the commitment of the participants to produce an output that can be implemented today to address present concerns and that will redound to the benefit of the country in the future.

Introductory Message

The introductory message was delivered by Mr. Tara N. Bhattarai of RWEDP/FAO. He thanked the FMB-DENR for accepting the suggestion of RWEDP to organize the training workshop. He then proceeded to state the importance that woodfuel plays in the energy situation and in the economies of RWEDP member countries. In the Philippines, for example, the annual woodfuel consumption value amounts to $1.1 billion or equivalent to 33% (382 peta joules) of the total energy consumption. This also translates to the same amount of annual savings for the country because it does not have to import additional fossil-based fuels to meet that part of the energy requirement that is being met by woodfuel.

Mr. Bhattarai concluded his message by reiterating the commitment of RWEDP/ FAO to provide advice and other forms of support to wood energy related activities in the Philippines, especially to those extension programs that deal with the integration of woodfuel production into farm and agroforestry production systems. The paper distributed to the participants by Mr. Bhattarai presenting the context of the workshop and introducing its essentials can be found in Appendix 3.

Inaugural Address

The inaugural address was delivered by Mr. Jose D. Malvas, Jr., the Director of the Forest Management Bureau of the Department of Environment and Natural Resources. Mr. Malvas, citing an estimate of the wood fuel requirements of the country, indicated that meeting this demand without further aggravating an already serious forest denudation problem is a major challenge to everyone. He then proceeded to state the objectives of the national training workshop and urged everyone to actively participate in the activity and apply and share what they learn when they return to their respective offices. He ended his address by declaring the training workshop open.

8. Introduction to the Training Workshop

Immediately after the opening program, Ms. Mayumi Ma Quintos, Forest Management Specialist of the FMB introduced the workshop. This material has been presented in the previous sections. The full workshop program is presented in Appendix 2.

9. Summaries of the Technical Papers, Field Trip and Group Discussions

Technical Paper No. 1 - National Woodfuel Situation

The paper was presented by Mr. Bayani S. Nera, the Assistant Director of the Forest Management Bureau. The first part of the paper presented the forest resources situation in the Philippines in terms of the remaining forest cover as of 1995.

Woodfuel resources in the country were then identified. Woodfuel resources include logging residues, timber stand improvement (TSI) removals, processing mills residues, forest plantations, mangrove forests, brush lands and other alternative sources of fuelwood.

Fuelwood supply and demand projections as estimated in the Master Plan for Forestry Development show a fuelwood demand of 44.4 million cu m by the year 2000 and is expected to grow to 52.1 million cu m by the year 2015. Supply, on the other hand, is projected to be lower than the demand. Supply and demand balance is projected at -16.62 million cu m and 14.93 million cu m by the year 2000 and 2015, respectively.

The commercialization of woodfuel is attributed to several factors. These factors include the presence of woodfuel dependent industries, woodfuel production as an additional source of income and the uneven distribution of the woodfuel resources.

Paper No. 2 - Household Wood Energy Consumption Study for 1995

This case study was presented by Ms. Felicisima V. Arriola, a Supervising Science Research Specialist with the Department of Energy. The primary objective of the study she reported on was to gather data on household energy consumption, application and other relevant factors affecting such consumption. The specific objectives were to: a) ascertain the relevance of household socio-economic characteristics and fuel preferences; b) determine household utilization of fuels, energy supply systems and appliances/devices/equipment; c) identify patterns of energy use among households; d) assess the potential household energy conservation and demand management techniques and interfuel substitution; and e) measure the incidence of cooking fuel switching and other changes in fuel consumption patterns that have occurred since 1990.

The major findings of the study are as follows:

- Fuelwood remains the most important fuel in the household sector contributing about half of its energy requirements.

- Fuelwood still contributes to the energy consumption of even high income households.

- Cooking, appliance usage and power generation are the major household end-uses of energy.

- The majority (80%) of fuelwood supplies are self collected.

- Privately owned lands are the major sources of self-collected fuelwood.

Paper No. 3 - Socio-Economic and Environmental Impacts of Woodfuel Production

This paper was presented by Ms. Ruby Buen on behalf of Director Eriberto Argete of the DENR’s Planning & Policy Studies Office. The paper discussed the environmental impacts of wood energy production, the nature of the impacts associated with wood energy production, conversion and utilization. The nature of the impacts on the environment was further categorized into on-site and off-site impacts. On-site impacts include negative effects on the hydrologic cycle, nutrient cycle, biodiversity conservation, soil stability, carbon sequestration capacity and the microclimate. Off-site impacts include changes in water yield and flow patterns.

As for the social impacts of woodfuel flow systems, the paper discussed employment generation and the provision of a cheap source of energy as positive impacts. Negative impacts come in the form of health ailments caused by indoor pollution resulting from woodfuel use.

Identified issues and constraints include: 1) the dearth of data on the actual impacts of wood energy production, conversion and utilization; 2) lack of appreciation of the role that wood energy plays in the economy and the environment which leads to a reduced emphasis on energy development in planning and policy formulation; 3) undervaluation of the value of fuelwood resources which results in over-exploitation of the natural resource base; and 4) unregulated gathering, production and use of fuelwood.

Paper No. 4 - Study on Woodfuel Flows in Six Urban Areas of the Philippines

This case study was presented by Ms. Felicissima Arriola of the DOE and covered the results of research conducted between August 1989 to August 1990. It aimed to determine the sources of traded fuels, patterns of distribution and consumption, market mechanisms of distribution from the rural areas to users in the urban areas and trading problems.

The areas covered by the research study were La Union and Santiago, Isabela and Metro-Manila in Luzon Island, Cebu City and Tacloban City in Visayas islands, and Cagayan de Oro in Mindanao Island. The information gathered by the study presented clear conclusions on the following issues:

1. the main sources of the wood used to supply urban fuel markets, including how these vary in different regions;

2. the actual and potential environmental impact of urban fuelwood and charcoal markets;

3. the economic significance of fuelwood markets for the rural supply areas, including the number of people involved and the contribution the trade makes to the household income;

4. the efficiency of the operation of these market systems; and

5. the sustainability of fuelwood and charcoal as urban household fuels including preliminary estimates of the scale at which supplies of these fuels can be sustained without serious environmental implications.

Paper No. 5 - Fuelwood Management Study of Sagada and Besao, Mountain Province

This case study was presented by Mr. Paquito Untalan of the Benguet State University (BSU) on behalf of the BSU-ANEC. He presented the results of the study conducted in 1996 to determine vital information on fuelwood management as implemented by the community clans in the areas. Among the significant findings of the study are:

1. The main source of cooking fuel in Sagada and Besao is wood followed by LPG and kerosene.

2. Most barangays (villages) in Sagada and Besao are electrified.

3. With most of the barangays in Sagada and Besao electrified, recreational and practical energy consuming devices present were found to be radios, televisions, refrigerators and electric irons.

4. The forest of Sagada and Besao is managed through a community/clan system which appears to be effective and sustainable because of their indigenous knowledge of carrying capacity which cautions them to over-exploit their forest.

5. Fuelwood is gathered free in the communal/clan forests but old folks pay for services of gathering and delivering wood to their homes. Male children gather fallen twigs and branches on their way home, while the larger trees are selectively cut for fuelwood by their fathers.

6. Aside from cooking, the other uses of wood are bonfire fuel, insect control, household and night travel lighting and space heating.

The recommendations of the study are:

1. A study on the role of women in forest management should be undertaken to clearly recognize and validate their contributions in ensuring the sustainability of forest resources.

2. The timber inventory and regeneration potential studies should be validated every two years to determine whether or not their management scheme is still sustainable.

3. The results of the study should be presented to municipalities concerned so that their system of forest management will not be abandoned.

4. The conversion from communal to clan to privately owned forest should be closely monitored because, being the trend in the area, this might lead to the widespread conversion of forest areas into other land uses.

5. The study should be duplicated in Ifugao, Abra, Kalinga Apayao, to have a picture of the forest resources of the Cordillera Administrative Region.

Paper No. 6 - Woodfuel-based Industrial Commercial Activities and their Contributions to the Rural Socio-Economy

Mrs. Merlita Pacis, faculty member of the Don Mariano Marcos State University presented this case study. She discussed some aspects of wood-fuel based commercial activities in La Union, an agricultural province in Northern Philippines. Among the various industries, tobacco flue curing/drying and bakeries were cited to be significant users of fuelwood in terms of volume used. It is estimated that the annual fuelwood consumption for tobacco dryers in the province amounts to 36.84 thousand tonnes while that of bakeries is 5.12 thousand tonnes per year. The paper also cited the highly positive contribution of these two industries to the local economy in terms of the number of people employed.

Paper No. 7 - Gender Specific Roles in Wood Energy Systems.

Juliet U. Texon, Chief, Project Development Officer of the DENR and member of the Gender and Development Focal Point System presented this paper. The paper cited experiences in various countries pertaining to the active roles played by women in fuelwood production. In these countries, women know what specific wood species will give high a volume within a short period of time as well as their calorific values. Compared to men, they also spend the most number of hours trekking long distances to gather fuelwood.

The impact of wood energy on health was also discussed citing its ill-effects among women who are the most exposed to indoor pollution emitted by fuelwood based cookstoves.

Knowing the importance that women play in wood energy systems as well as in wood energy based economic activities, extra efforts should be undertaken to address the issues confronting them.

Field Trip

Day two was spent on a field trip to a fuelwood plantation in a neighboring province (Bigbiga, Sudipen, La Union). Bigbiga, the name of the village visited and where the fuelwood plantation is located in Sudipen, is a typical farming village with an estimated population of 1,100. Main crops are palay (rice) and tobacco. In the early 1980s, a fuelwood plantation covering 980 hectares was established by the National Tobacco Administration in the mountain areas of Sudipen to supply the needs of its tobacco drying/ flue curing plants.

The participants left Baguio City at 8:00 A.M. and arrived in the area at 10:00 A.M. They were divided into two groups. One group went up to the plantation area and the other one stayed in the village to interview residents regarding their fuelwood supply and consumption. Information items gathered included the current situation and constraints on fuelwood production, marketing and existing extension and support services.

Among the findings are the following:

1. Households use fuelwood for daily cooking throughout the year. There are a few occasions during the year when they use other forms of fuel for this activity. These include occasions when there are severe storms and they use other forms of fuel such as kerosene and Liquefied Petroleum Gas (LPG).

   For those households who own sizable lots, fuelwood supplies are gathered from their own homelots while those with smaller lot areas buy their fuelwood from the market. A bundle of fuelwood with a dimension of 2ft by 1 ft. by 1 ft. costs P10.00 each.

2. The demand for fuelwood usually peaks after the tobacco harvesting season which is usually during the summer months of March and April. Fuelwood is used in the tobacco curing barns of farmers. They get a regular supply of the product from so-called "truckers". The price of the fuelwood ranges from P400.00-P600.00 per cubic meter.

3. The fuelwood plantation is already mature and the National Tobacco Administration has applied for a harvesting permit from the DENR. However, villagers oppose this move as they perceive that this will result in negative environmental impacts on the village; specifically, they believe it will have an adverse effect on their steady water supply.

4. As a result of occasional government information campaigns villagers are aware of the importance of planting trees for the maintenance of a good environment in their area. However, the planting of trees depends on the availability of seedlings in DENR field offices and the availability of planting areas. They are not inclined to plant trees near rice and tobacco fields as they perceive that the shade from canopies will stunt the growth of crops.

5. The fuelwood stand owned by the NTA appears to be regularly subjected to trimmings/prunings and occasional cuttings as evidenced by some coppicing stumps.

Group Discussion

The participants were divided into three discussion groups, each devoted to a particular topic. Mr. Bhattarai gave pointers on how to go about this activity. With the various papers and case studies already presented and the field trip conducted during the previous days as background material, each group was asked to discuss the current woodfuel situation, its constraints and possible solutions to national woodfuel problems. Three topics were dealt with:

1) Production and Utilization
2) Marketing
3) Extension and Support Services

Presentation of Outputs

A presentation of outputs by the discussion groups was held in the afternoon of Day Three. After each presentation, a brief discussion immediately followed. The outputs were as follows:

Production and Utilization

Current Situation:

1. woodfuel is needed to supply the energy requirement of households and industries;

2. woodfuel production is not fully integrated in farmers' production systems;

3. available technologies do not reach the intended end-users;

4. potential sources of energy are not fully utilized (e.g. rice hulls, rice straws, corn cobs, etc.);

5. fuelwood gatherers may cut anything anywhere.

Constraints:

1. lack of trained personnel, instrumentation;
2. top down mentality;
3. farmers' needs are immediate (fuelwood vs. cash crops);
4. farmers are risk averse;
5. lack of tenure security;
6. inadequate government support;
7. inadequate incentives to investors;
8. there are alternative sources of woodfuel (public forest);
9. threat to production of other crop; and
10. lack of knowledge on appropriate production technologies.

Possible Solutions:

1. participatory technology development;
2. aggressive information dissemination on woodfuel production and utilization; and
3. development of technologies related to the utilization of other potential energy sources.

Follow-up Actions:

Consultative workshop to be organized for government and non-government agencies and other interested groups to discuss, among other things, the following:

- definition of the terms related to fuelwood;
- knowledge gaps;
- data assessment;

- enactment of laws concerning woodfuel; and
- creation of TWG.

Marketing

Current Situation:

1. Available market
   - tobacco curing;
   - potteries;
   - bakeries;
   - households;
   - restaurants;
   - orchid production (charcoal);
   - space heating;
   - salt making;
   - ice cream making;
   - slaughter house, etc.

2. Supply and demand
   - conflicting information/data (Master plan and DOE).

3. Market flow
   - gatherer;
   - trader;
   - retailer;
   - end-user.

4. No IEC re: best species for fuelwood

5. Fluctuating prices
   - wet season (high price, less harvesting);
   - dry season (low price, less supply).

Constraints:

1. No standard price
2. Non-standardized unit of measurement
3. Resistance of the community to harvest
4. Lack of statistical data
   - source of fuelwood (private/public)
   - support of other provinces to meet the demand of the province
5. Uncertainty regarding the demand for fuelwood considering the other available sources of energy, e.g. LPG
6. Accessibility.

Possible Solutions:

1. Provincial/municipal ordinances to provide standard price/cu m/species
2. Standardize unit of measurement (cubic meter)
3. Strengthen IEC
4. Conduct a study to trace actual sources of fuelwood
5. Improve road network
6. Locate plantations in accessible areas
7. Form gatherers into cooperative.

Extension and Support Services

Current Situation:

1. Policy
   - existing policies emphasize multiple-use forest management. There is no clear cut guidelines on fuelwood production except that such is subsumed under any other program of the Department; and

   - Transport documents are issued only for planted trees cut from ISF, privately owned lands and IFMA.

2. Credit
   - no initiative from the local fuelwood gatherers to venture into fuelwood plantation development; and

   - only cooperatives (IFMA), organized communities (PO) are presently involved in forest management but specifically for fuelwood plantation development.

3. Extension
   - overlapping and conflicting policies and program thrusts among the various agencies involved.

Constraints:

1. Policy
   - no specific DENR policies addressing woodfuel management.

2. Credit
   - no credit facilities or institutions are providing support to the fuelwood gatherers (financial assistance are provided by the local traders).

3. Extension
   - fragmented policies of the various agencies involved in fuelwood management;
   - insufficient coordination mechanisms among the various agencies.

Possible Solutions:

1. Policy
   - project development programs, e.g., IFMA, CBFMA, etc. must address, among others, the woodfuel requirements of the wood-based industries and households. This should be the basic content of the development plan.

2. Credit
   - holistic organizing of fuelwood gatherers;
   - site identification;
   - species suitability assessment;
   - providing technical assistance;
   - establishing links with FI;
   - marketing;
   - modified procedural requirements to adapt to limited technical ability of fuelwood gatherers.

3. Extension
   - regular inter-agency consultation;
   - training on uniform fuelwood information collection techniques; and
   - provision of IEC materials.

Closing Ceremony

Brief remarks were given by the participants on the conduct of the training workshop. Mr. Demetrio L. Rebugio, represented the participants while Mr. Bhattarai represented the FAO/RWEDP. Mr. Oscar A. Suguitan, the Regional Technical Director for Forestry of the DENR-CAR provided the first of the two closing remarks in the program. On the basis of the presentations made and the workshop that followed, he said that all the topics relevant to the promotion of fuelwood production as a component of upland development programs had been amply covered. In closing, he reminded everyone on the urgency to act on various problems besetting the forestry sector. The right time to act is now for any delay maybe disastrous.

The other closing remark was made by Mr. Sabado Batcagan, the Assistant Secretary for Planning and Policy Studies of the DENR. He particularly dwelt on the dynamics of forestry policies as an effective solution to the myriad problems of the sector. Policies, he said, should be holistic in approach starting from the planning stage down to the implementation phase. These should always take into consideration the multi-faceted aspects of realities, e.g. ecological, economic, social, cultural, etc. and strike a balance among these oftentimes competing concerns. Policies on fuelwood should therefore follow this guideline. He ended his remarks by exhorting everyone, especially the DENR implementors in CAR, to be imaginative and not be bounded by the limitations provided by certain policies. Policies are not permanent; the only permanent thing in this world is change, he stated.

PART II. Technical Papers

1. NATIONAL WOODFUEL SITUATION

by

Bayani S. Nera

1.1 Introduction

In general the Philippines is a biomass-rich country. Biomass fuels such as wood, wood waste, charcoal, and agricultural residues are the most important domestic energy resources that are widely used by the household sector especially in the rural areas. The use of fuelwood is projected to continue because of the prevailing poor economic conditions of the majority of the rural population. Furthermore, charcoal and fuelwood also play an important role as an energy source in rural industries such as brick kilns, bakeries, tobacco curing, potteries and others.

1.2 Forest Resources

As of 1995, the Philippine forests comprised 5.59 million hectares or 18.63% of the country's total land area of 30 million hectares. Of the total forest areas, dipterocarp forests accounted for 3.69 million hectares (66.07%). This type of forest contains in several layers a wide variety of dominant dipterocarp tree species as well as many lesser-used non-dipterocarp species

Mossy or mid-mountain forests account for about 1.06 million hectares (18.96%) and are usually found to be dominated by relatively stunted trees from the Podocarpaeae, Mrytaceae and Fagaceae families with boles covered with epiphytes. Submarginal forests on the other hand, include forests dominated by legumes and other less utilized species in shallow and excessively drained limestone soils and account for about 0.49 million hectares (8.75%). Pine forests were estimated to cover 0.23 million hectares (4.12%) and mangrove forests only 0.12 million hectares (2.11%).

The forest cover has been drastically reduced over the past several decades. There was an estimated 17 million hectares of forest in 1934 and about 11,409,821 hectares of this have been degraded/converted to other land uses. This figure corresponds to an average deforestation rate of 187,046 hectares per year.

The table below summarizes the present land-use of the country.

Table 1. Present land-use, 1995

LAND USE/ FOREST TYPE	AREA	PERCENT SHARE
Forest	5,590,179	18.63
Dipterocarp	3,693,279	66.07
Old Growth	804,900	
Residual	2,888,379	
Pine	230,300	4.12
Closed	125,000	
Open	105,300	
Submarginal	489,200	8.75
Mossy	1,059,700	18.96
Mangrove	117,700	2.11
Brushland	2,293,000	7.64
Other Land Use	22,116,821	73.72
TOTAL	30,000,000	

1.3 Woodfuel Resources

Woodfuel resources are abundant and certainly stretch far beyond those areas covered by forest. Potential sources of these woodfuel are logging residues, Timber Stand Improvements (TSI) removals, processing mills residues, tree plantations, mangrove forests, brushlands, and other alternative sources.

A. Logging Residues

Logging activities in any form can be a major source of fuelwood in large quantities. A study conducted by Virtucio (1970) shows that for every 100 cubic meters of log or timber produced, 80 cubic meters of logging waste were also produced. These logging wastes include tops, branches, stumps, abandoned logs, damaged residuals and butt trimmings. However, the potentially utilizable portions of logging waste are not commonly used due to high transport cost. Besides, only the solid and bigger pieces of logging waste or residue may be utilized while small branches, twigs, and loose bark are left in the forest to rot as organic matter. Further, these potential sources of fuelwood have keen competition with other end uses such as small lumber, furniture components and other wood products.

Table 2 shows the estimated amount of logging waste based on the annual log production from 1990 to 1995.

Table 2. Log production and the corresponding recoverable log waste, 1990 – 1996

YEAR	LOG PRODUCTION (cu m)	LOG RESIDUES (cu m)
1996	760,449	608,359
1995	758,490	606,792
1994	957,369	765,895
1993	1,021,588	817,270
1992	1,438,237	1,150,590
1991	1,921,595	1,537,276
1990	2,502,625	2,002,100

Domestic log production has displayed a downward trend during the past six years which is attributed to the logging ban imposed by the government in old growth forests and in areas above 1000 meters elevation and 50% slope. This logging prohibition has led to a decrease in the number of timber license agreement holders from 75 in 1990 to only 32 in 1996. However, forest plantations and tree farm development have continued to attract the interest of private investors with 200 Industrial Forest Management Agreements (IFMA) and 33 Industrial Tree Plantation Agreements (ITPA).

B. Timber Stand Improvements (TSI) Removals

Timber Stand Improvement activity in the residual forests is another potential source of wood for fuel. In the process of TSI operations some of the undesirable trees or weed species are cut to free the potential crop trees from the competition for space and soil nutrients. This activity offers the possibility of an intermediate yield between cutting cycles through the utilization of TSI removals.

According to figures gathered from sample plots on four major logging concessions in Mindanao (Banaag and Weidelt), the gross volume of trees that can removed in a TSI operation in a ten to twenty-year old second growth forest averages approximately 82 cubic meters per hectare. Considering allowances for felling damage, rot and other unavoidable losses, the quantity of wood that can be salvaged in TSI operations will amount to about 65 cubic meters per hectare.

At present, there are about 2.9 million hectares of residual forests and a significant portion are in a poor state and in need of immediate treatment to bring them back to a productive state. TSI application to these forests would give us a very rough estimate of 188.5 million cubic meters of wood available for fuelwood and other uses. However, bringing these wood materials from the forest to the market as fuelwood may not be financially viable. The RP-German TSI projects in selected concession areas in the country found out that commercial utilization of TSI removals is financially feasible only in areas where there are ready buyers and processors of these wood materials such as box factories.

C. Processing Mills Residue

Log processing such as saw milling, veneering and plywood manufacture generates a considerable amount of wood waste. Saw mill residues are in the form of sawdust, slabs, trimmings, edging, and defective wood parts. According to the FPRDI, saw milling of second growth timber has a 64% recovery rate. Of the 36% mill waste, defective wood parts forms the biggest residue of 10%, followed by sawdust 11%, slabs 8%, edging 4%, and trimmings 3%.

In the case of veneering and plywood manufacture, the residues are primarily in the form of round-ups, veneer trimmings, and log centers. The recovery is estimated to be 53% of the total log volume. In contrast to logging residues, the transportation of wood residues from these processing mills to the market is not a problem since the consumers are nearby.

Table 3 shows the volume of lumber and plywood produced and the corresponding estimated amount of processing residues from 1990 to 1995.

Table 3. Lumber and plywood production and the corresponding estimated amount of processing residues, 1990 - 1996.

YEAR	LUMBER (cu m)		PLYWOOD (cu m)	
	Production	Residues	Production	Residues
1996	313,012	176,069	507,645	450,176
1995	286,036	160,895	289,999	257,169
1994	406,952	228,911	258,397	229,145
1993	439,965	247,480	260,714	231,199
1992	647,186	364,042	330,580	293,156
1991	725,913	408,326	320,528	284,242
1990	840,973	473,047	396,946	352,009

Lumber and plywood production similarly suffered a negative growth rate due to a log supply shortage. Processing plants have to import raw materials from the international market to meet their plant capacity.

D. Forest Plantations

Forest plantation programs in the country have been launched and implemented by both private and government sectors. Most of the private sector plantations have been established for production purposes while most of the regular government reforestation programs are intended to rehabilitate denuded areas and to protect watersheds.

Table 4 shows the plantation established/area reforested by the government and the private sector. The government reforestation program includes the DENR reforestation activities under contract and other foreign-assisted projects, community-based reforestation projects, watershed rehabilitation, enrichment planting and other tree planting activities of other government agencies. Private sector plantation establishment refers to TLA reforestation compliance, TLA enrichment planting, industrial tree plantations and the planting activities of other non-government organizations.

The number of tree plantations established within private lands is not known, hence, it is not included in the table. The DENR is currently in the process of establishing a database to determine the extent of the involvement of the private sector in this activity.

Table 4. Area reforested by the government and private sector, 1990 - 1996.
(in hectares)

YEAR	GOVERNMENT	PRIVATE	TOTAL
1996	18,869	27,227	46,096
1995	21,841	43,392	65,233
1994	18,032	31,519	49,551
1993	6,347	12,864	19,211
1992	24,304	16,289	40,593
1991	73,602	19,437	93,039
1990	153,949	37,714	191,663

Firewood or fuelwood coming from established plantations are by-products of an assortment of logs, pulpwood, poles and piles since most plantations are primarily under integrated forest management, unless established and managed solely for fuelwood production.

E. Mangrove Forests

Mangrove forests are a unique type of forest located on tidal flats and sea coasts extending along the streams where the water is brackish and composed mainly of bakauan, pototan, api-api, nipa and the like. Aside from the conversion to fishponds and prawn farms, mangrove forest destruction has also been caused by over-exploitation for timber, firewood, charcoal and tanbark. Mangrove tree species are known for their high calorific value and the market demand for mangrove trees as fuelwood is considerably high. However, the enactment of the Republic Act 7161 has banned the cutting of mangrove species in an effort to preserve the remaining mangrove forest of the country which was believed to be around 450,000 hectares during the 20's.

F. Brushlands

Brushlands are degraded areas dominated by a discontinuous cover of shrubby vegetation and small trees like ipil-ipil, kakauate, alibangbang and other pioneer species that grow on marginal lands. Such areas are a common source of firewood of nearby communities. Assuming an estimated average volume of 1.95 cubic meters per hectare available for fuelwood from brushlands (DAP 1992), there will be around 4.47 million cubic meters of fuelwood nationwide.

G. Other Alternative Sources of Fuelwood

Trees planted in agroforestry farms, integrated social forestry areas, private homelots and family backyards are considered to be potential alternative sources of fuelwood. Trees planted along terraces, boundary lines, and those intercropped with agriculture and fruit crops are a common source of domestic fuel of the rural households. However, the amount of this fuelwood which is available has not properly been assessed at the national scale.

Further, agricultural crop residues such as coconut (shell, husk and fronds), sugar cane bagasse, rice husk and straw, corn cobs and other agricultural wastes are also acceptable alternative biomass fuels, especially in the rural areas where these products are available in large quantities.

1.4 Fuelwood Supply and Demand Projections

The country's Master Plan for Forestry Development (1990) presented the national firewood demand up to 2015. It has projected that the country will need 44.4 million cubic meters of firewood by the year 2000, rising to 52.1 million cubic meters in the year 2015. However, the plan projected that the demand for firewood would grow slower than the population because of urbanization.

Table 5 summarizes the various firewood sources and projected quantities under the master plan scenario. According to this data the supply-demand balance is expected to decrease over the period covered.

Table 5. Firewood supply and demand balance (in million cubic meters)

FUELWOOD SOURCE	2000	2005	2010	2015
Dipterocarps	3.03	3.27	3.52	3.76
Pine Forests	0.26	0.26	0.26	0.26
Existing Plantations	2.33	2.57	2.81	3.05
New Plantations	2.82	5.20	7.59	9.97
Marginal Lands	0.20	0.20	0.20	0.20
Mangroves	0.22	0.22	0.22	0.22
Brushlands	4.07	3.30	2.53	1.76
Grasslands	0.03	0.03	0.02	0.02
Other Extensive	4.49	4.20	3.91	3.62
Intensive	7.83	7.87	7.92	7.96
Urban, Others	0.24	0.27	0.31	0.34
Waste wood	2.26	3.51	4.76	6.01
SUPPLY	27.78	30.91	34.04	37.17
DEMAND	44.44	46.40	48.40	52.10
BALANCE	-16.62	-15.49	-14.36	-14.93

Source: Master Plan for Forestry Development, 1990.

The firewood demand figures include the requirements of both households and industries. Of the total demand for firewood, approximately 82% is accounted for by the household demand.

The household demand for energy is mostly for cooking, especially in rural areas, and is supplied by biomass fuels such as firewoods and agricultural residues. Rural people usually cut trees and gather fuelwood from the nearest trees within easy access to their homes. However, others gather fuelwood for a living.

The industrial fuelwood demand is partly accounted for by the generation of steam power and/or electricity for use in factories or in nearby settlements and partly by curing barns for tobacco and clay, charcoal production, and bakeries.

Under the Master Plan scenario, projected firewood deficits can be met by alternative sources of energy such as electricity and oil. But the establishment of additional plantations solely for firewood production including the planting of firewood trees around homelots would be a better alternative firewood source. Further, more efficient utilization of firewood through improved cooking stoves would be helpful.

1.5 Factors Affecting Woodfuel Commercialization

Non-rural fuelwood users have made woodfuel, both in its raw form and in its charcoal form, an important commercial commodity and has led to the formation of informal fuelwood trading systems within the rural areas, from rural areas to urban users, and even from rural areas of one region to urban areas of another region. Fuelwood commercialization is believed to be influenced by the following factors:

A. The presence of local industries that depend highly on fuelwood as a source of energy

The high demand for fuelwood due to the presence of local industries that depend on fuelwood as a source of energy significantly affects the commercialization of the resource in the area. A case in point is the LIocos region where the tobacco and salt making industries use a lot of woodfuel. Local woodfuel shortages brought about by these local industries tend to create a local market and even an inter-regional woodfuel market. As a result, arrangements are made with fuelwood plantation owners, contracts are made with middlemen, and even open market purchases or energy tree farm plantations result.

B. Additional source of income

Integrated forest management like agroforestry practices provides additional sources of income for the farmers. Fuelwood production and trading are significant during the dry season when agricultural crop production is less viable. Farmers usually harvest the fuelwood manually and trade it at roadsides or in the nearest market for additional cash.

C. Uneven distribution of fuelwood resources

The fuelwood crisis is not that significant at the national level. Commercialization of woodfuel is likely to occur in places/regions where fuelwood is less concentrated or totally absent. The heavy demand for fuelwood in these areas is evident from the prevailing high prices of fuelwood.

1.6 Woodfuel's Contribution to the Economy

The contribution of non-conventional fuels to the country's energy needs is a matter of some uncertainty. The Office of Energy Affairs (OEA) in its National Energy Plan for 1992-2000, reports that the current contribution of non-conventional fuels is less than 13% of the total energy requirement of the country. However, this estimate considers only the use of bagasse and other forms of agricultural waste and residues by large agro-industrial consumers, overlooking the consumption of biomass fuels by thousands of small-scale industries as well as in close to 8 million households nationwide.

The Biomass Users Network (BUN) on the other hand, reports that non-conventional fuels meet 73% of the country's total energy needs. And fuelwood alone meets 52% of the total energy requirements of the country.

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2. HOUSEHOLD WOOD ENERGY CONSUMPTION STUDY

by

Felicisima Arriola

2.1 Primary Objective

- To gather data on household energy consumption, application and other relevant factors affecting such consumption.

2.2 Specific Objectives

- To ascertain the relevance of socio-economic characteristics of the household and fuel references;
- To determine household utilization of fuels, energy supply systems and appliances/ devices/equipment;
- To identify patterns of energy use among households;
- To assess the potential household energy conservation and demand management techniques and interfuel substitution;
- To measure the incidence of cooking fuel switching and other changes in fuel consumption patterns that have occurred since 1990.

2.3 Scope and Coverage

- Nationwide sample of not less than 6,000 households
- Sample deemed sufficient to measure the levels and pattern of energy consumption at the national and regional levels

2.4 Major Findings

- Fuelwood remains the most important fuel in the household sector contributing about half of the energy requirements
- Fuelwood still contributes to the energy consumption of even high income households.
- Cooking, appliance usage and power generation are major households end-uses of energy.
- The majority of fuelwood supplies are self-collected (80%).

- Privately owned lands are the major sources of self-collected fuelwood; a very minimal amount is obtained from government land.
- Most of the households believed that cooking with fuelwood results in better tasting food.
- There is still a misconception that fuelwood contributes to forest denudation.
- Biomass residues and fuelwood remain the cheapest fuels (P0.12/MJ and P0.19/MJ, respectively) as compared with LPG (P0.30/MJ) and charcoal (P0.30/MJ).
- Convenience, availability of fuels and change in income are the factors that are thought to trigger fuel switching.

Percent of households using each fuel, 1995

	Electricity	LPG	Kerosene	Charcoal	Fuelwood	Biomass Residues
Urban	85	49	68	44	44	17
Rural	48	17	91	33	82	41
Philippines	67	33	80	39	64	29

Percent of households using each fuel by end-use, 1995

Fuel/End-Use	Urban	Rural	Philippines
Electricity			
Lighting	85	48	67
Cooling	15	2	85
TV Viewing/Radio Listening	80	43	68
Freezing	42	13	27
Space Cooling	64	21	42
Ironing	60	22	41
Others	32	26	29
LPG			
Cooking	49	17	33
Water Heating	6	1	4
Kerosene			
Cooking	30	13	21
Water Heating	5	2	3
Lighting	44	85	65
Fire Starting	26	40	33
Fuelwood			
Cooking	44	82	63
Water Heating	4	10	7
Others	1	2	2
Charcoal			
Cooking	34	13	23
Water Heating	2	1	1
Ironing	15	26	20
Biomass Residues			
Cooking	16	36	26
Water Heating	1	4	3
Ironing	1	5	3
Others	1	3	2

Household perceptions on fuelwood usage

FUELWOOD PERCEPTION	PERCENT
Cooking with fuelwood results in tastier food	85
Gives hotter flame	76
Dirty	75
Cooking with commercial fuel is more expensive than fuelwood	71
Cause of forest denudation	64
Inconvenient to use	46
Difficult to get	42
Kitchen inappropriate for fuelwood	37
Expensive	37

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3. SOCIO-ECONOMIC AND ENVIRONMENTAL IMPACTS OF WOODFUEL PRODUCTION

by

Eriberto Argete

3.1 Introduction

Fuelwood comes from trees and shrubs. Wild indigenous species of trees and shrubs have been traditional sources of fuelwood, but introduced species (exotics) have also contributed to the supply. The major concentration of wild tree species is in natural forests but pioneer tree species may also be distributed outside forest openings in grasslands and in brushlands. Some of the tree species introduced into the country have spread wild in the countryside where they mingle with indigenous trees in disturbed areas. But many of the exotics grow only with man's intervention and are excluded in most secondary and primary forests (DAP, 1992).

Fuelwood may therefore come from natural stands, such as virgin forests, second growth forests, mangrove forests, brushlands, and thickets along creeks and river banks, or from artificial stands such as plantations and backyards. The existing and potential sources may be sitting on steep sloping or moderately sloping to flat terrain and on landslide-prone or on stable areas.

The totality of economic activities which comprise making fuelwood available to the end-user is defined as a fuelwood production system, regardless of whether or not the source of the fuelwood is natural resources or plantations and backyards. Activities essential to the system include extraction, processing and packaging, and marketing.

Extraction involves the choosing of species to be cut with or without replacement, the selection of trees to be cut, the decisions involving the part of the tree to harvest, the decisions on the equipment and power to be used, and the management alternatives such as to clear-cut, or to earmark patches to be cut while sparing the rest for reserve stock and/or for environmental considerations.

It is obvious that the extraction phase causes not only environmental impacts but also socio-economic impacts. Whether extraction will be detrimental or not will depend on the technology used and on the rate of extraction which is a function of demand.

3.2 Environmental Impacts of Wood Energy Production

In the study conducted by the Development Academy of the Philippines (DAP), several "assumptions" were made concerning the direct or immediate impacts of fuelwood extraction under different fuelwood production systems. These are:

Impact 1: Fuelwood gathering creates openings in the vegetation and immediately affects the microclimate.

Impact 2: It involves the removal of nutrients from the ecosystem due to harvesting of biomass.

Impact 3: Cutting of trees for fuelwood may result in the killing of trees which rarefy plant and animal populations.

Impact 4: It contributes changes to the vegetation of watersheds, which in turn affect hydrologic properties.

The study also categorized the means or methods by which fuelwood may be extracted; which are as follows:

Method 1: Harvest of logging wastes, e.g. crown tops, and of kaingin left-overs, stumps and unburned timber.

Method 2: Harvest of thinnings, prunings and liberation cuttings in timber stand improvement operations.

Method 3: Selective cutting of fuelwood tree species.

Method 4: Clear-cutting of stand with replanting.

Method 5: Harvest by coppice and/or lopping of stock of trees.

Method 6: Non-selective cutting (and killing) of trees without replanting.

Method 7: Gathering fallen twigs and branches.

A. Nature of Environmental Impacts Associated with Wood Energy Production, Conversion and Utilization

For clarification, it is important that the on-site (immediate) impacts be differentiated from off-site impacts. Immediate or on-site impacts refer to the instant local changes of the physical and biological environment following the cutting, lopping, coppicing and transporting of fuelwood. Off-site impacts refer to the environmental effects absorbed by adjacent and far-flung ecosystems due to the production of fuelwood, for example, changes in climatic patterns, floods, drought, sedimentation, water supply, etc. They include effects on agriculture, fisheries, etc.

1. <u>On-site Environmental Impacts</u>

a. Hydrologic Cycle

Fuelwood extraction affects the hydrology of a watershed through an increased evapotranspiration rate. In the hydrologic cycle, evapotranspiration is one of the exits of water from the watershed. Simply, more evapotranspiration means less water for the watershed.

Surface run-off and basal flow, which combine to represent stream flow, are the other exits of water from the watershed. Surface run-off refers to rainwater lost to streams via soil surfaces. Basal flow refers to the water discharged into the stream via the soil horizon through infiltration and percolation. These exits are inversely proportional to the density of the vegetative cover and the soil porosity. A sparse cover decreases soil porosity and results in soil compaction, which in turn favors surface run-off. A dense and diverse cover, in contrast, results in increased soil porosity, which favors greater infiltration and more basal flow.

Fuelwood extraction, which may result in a decrease in stand density, may trigger soil compaction and greater run-off. The virgin forest represents the ideal situation, which provides maximum soil porosity and recharges the maximum amount of water to the watershed.

The removal of the canopy correspondingly decreases interception loss, increases soil compaction, increases surface run-off and sediment yield, and reduces infiltration capacity. Experiments in a 10 to 15 year old natural Benguet Pine (<u>Pinus kesiya</u>) stand show that interception can be significantly reduced by thinning (Florido and Saplaco, 1982a). For example, the percent interception of the control plot (no thinning) was 13.9% compared to the 8.4% interception loss by the heavily thinned stands. The same authors (Florido and Saplaco, 1982b) also found that thinning increased compaction, e.g. the heavily thinned stand had 2.91 kg/cm2 value compared to the 2.54 kg/cm2 for the control. Veracion (1983), following the same treatments but confining his analysis only to rain storms with rainfall intensity averaging 9.9 mm/hr, found that surface run-off and sediment yield (t/ha) increased with increasing thinning intensity while, conversely, infiltration capacity decreased with increasing thinning intensity.

Inversely, the establishment of forest plantations for wood energy would have positive impacts on the watershed in terms of increased water interception, lesser soil compaction, surface run-off and sedimentation, and would decrease the evapotranspiration rate.

Several studies show the importance of trees in the hydrologic cycle. Costales (1979), in his studies demonstrated that forested soils have higher infiltration rates than transformed soils, i.e. forested areas, 4.5 cm/hr; terraced plots, 2.63 cm/hr; burned area, 2.00 cm/hr and grazed area, 0.94 cm/hr. In Binga Watershed, Costales (1982), showed that soil compaction under different stands of tree plantations varies with the litter production. Soils from Benguet Pine (Pinus kesiya) were the least compacted (e.g. 0.417 and 0.525 kg/cm2, respectively) and also had the most litter (43.47 and 44.54 g/cm2), while <u>Eucalyptus camaldulensis</u> and Yemane (Gmelina arborea) had soil compaction values of 1.867 and 1.1677 kg/cm2, respectively. In contrast, Baconguis and Dano (1984) showed that Benguet Pine stands in the Buhisan Watershed in Cebu City had less infiltration than Yemane stands.

In spite of the apparent conflict of results, the studies show that trees improve the hydrologic status of upland sites. Fuelwood plantations in degraded watersheds therefore would be a welcome development for attaining the dual objective of producing energy and conserving water.

b. Nutrient Cycle

Availability of nutrients determines the survival of an organism in an ecosystem. Nutrients in soluble form are taken up by plants from the soil and again returned to the soil through the litterfall. Due to the high rainfall in the tropics, soluble nutrients are vulnerable to run-off and leaching. Unlike in the temperate forests where nutrients are stored in the soil, tropical rainforest (TRF) ecosystems store their nutrients in the biomass. Turnover of nutrients through the litterfall into the soil and back to biomass is very rapid, such that, at any given time, the tropical soil contains very low amounts of available nutrients.

This implies that fuelwood production is a form of nutrient removal from the ecosystem, regardless of whether or not the source comes from logging wastes, thinning, clear-cutting or coppicing operations.

The forest soil constantly receives litterfall from the canopy bringing fresh nutrients to immediately replenish uptake by roots. Total litter productions from Philippine vegetation have been measured in Mt. Makiling, Laguna (Sajise et al, 1979), and in the mountain forests along the slopes of Mt. Apo in Davao del Sur (Kellman, 1970). Litter production in the secondary forest of Mt. Makiling was estimated to be 17.6 t/ha/year while in the secondary forest of Mt. Apo was estimated to be 16.3 t/ha. /year. Thus, if the forest cover is harvested, this nutrient cycling is sharply decreased or completely broken depriving the soil of nutrient replenishment. Approximately, this loss may be translated as 2 bags of nitrogen fertilizer per hectare per year.

To quantify the amount of nutrient in a stand, the method employed is to take plant tissues and analyze them for their chemical contents per unit volume (or mass) of tissue. Then biometry is employed to estimate the average volume (or mass) of a vegetation stand on a hectare basis. To get the size of a nutrient in a hectare of vegetation, one would just multiply the chemical content per unit volume with the estimated total volume (or mass) per hectare. It is convenient to know the proportion of nutrients on leaves, branches, stem and roots because in certain stands, branches are trimmed for fuelwood and the trunks for lumber. In fuelwood lots, stem and branches are used for fuelwood. This way, one could separate nutrients lost due to fuelwood production. No such studies, however, have been undertaken in the Philippines.

c. Biodiversity Conservation

There is a dearth of information about the impact of fuelwood harvesting on the biodiversity of the tropical forest (both flora and fauna). Logging and fuelwood harvesting involve the extraction of wood and usually killing the trees. There are, however, extraction methods for fuelwood which do not kill the trees, unlike logging which always kills trees and results in damage to the flora and fauna in the forests as well as in population rarefaction. (DAP, 1995).

The impact of the low intensity manually operated fuelwood harvesting on biodiversity must be minimal if not insignificant. However, species earmarked for fuelwood may be threatened to extinction if cutting is not regulated, for example, since there is no policy yet to protect preferred fuelwood species to meet increasing demand.

Mauricio (1982) found that the relative proportion of fuelwood producing species based on stand species composition and abundance varies with unlogged, newly logged and 15 years logged-over stands with figures of 49.2%, 58.6% and 86.1%, respectively. The trend was that fuelwood producing lesser known species (LKS) increase in importance with time. Timber stand improvement (TSI) managers regard the LKS and fuelwood species as impeding the selected potential crop trees (PCTs) and therefore are the objects for thinning and liberation cutting operations. Mauricio (1982) recommends that the best time to remove the LKS, pulpwood, and fuelwood species may commence as early as the 5th to as late as the 10th year after logging. While the TSI practice may give increases in the growth of PCTs (Manila, 1985), there is a danger that the weeding of the impeders will cause extinction of the non-pioneer LKS and fuelwood species.

It was also speculated that the forest occupants (who are also sometimes fuelwood and charcoal producers), were responsible for cutting the most accessible trees, and the smaller manageable trees. Thus, if the forested area has already been harvested of big timber trees, the fuelwood gatherers cut the smaller trees to further decimate the populations of forest trees in the area. In this case, biodiversity suffers the most.

d. Soil Erosion

The character of the vegetation is an important determinant of soil erodability of a forest area. Serrano et al (undated) claim that among the four stands studied, the mixed dipterocarp secondary forest gave the highest erosion rate with an estimated soil loss of 1.19 t/ha/yr., while man-made plantations, namely, dipterocarp (in Makiling Botanic Gardens), kaatoan bangkal, and moluccan sau yielded 0.34. 0.20 and 0.02 t/ha/yr., respectively. Kellman (1968), on the other hand, observed that the primary forest allows only 0.09 t/ha/yr., the fallow forest 0.13 t/ha/yr.; but the 12-yr old kaingin registered the most soil eroded at 27.6 t/ha/yr. However, Serrano (undated), in another paper claimed that sediment production from densely forested watersheds is nil, as low as 0.02 t/ha/yr. The Upland Hydroecology Program (1978) also showed that cropping history is a factor in soil erodability. For example, an old kaingin is more erosive than a newly opened kaingin while undisturbed grassland and ipil-ipil (Leucaena leucocephala) stands yield little erosion (DAP, 1992).

e. Carbon Sequestration

Forests play a crucial role in the earth's carbon cycle through assimilation, storage, and emission of carbon dioxide (CO2). When a forest area is clear-felled, the carbon in the vegetation as well as the carbon in the underlying soil gets oxidized to form CO2, which is released into the atmosphere. Besides deforestation, forest biomass burning (including shifting cultivation, fuelwood burning, forest fires, diversion of forest area for other purposes, and burning of grasses and litter) contributes to the release of CO2 in the atmosphere (Ramani, 1995).

Forests also act as sinks as they sequester atmospheric carbon and thereby initiate its build-up. Carbon is sequestered only during the period when the forests gain mass; on maturity, forests neither accumulate nor release carbon.

Carbon sequestration is the process by which the earth's carbon contents are absorbed by plants. It is important that carbon be captured from the atmosphere since carbon is the main element which can cause global heating, especially if present in large amounts in the atmosphere.

Forests contain an estimated 66% of the terrestrial above ground carbon and approximately 45% of the terrestrial soil carbon. In addition, global forests account for approximately 90% (90 gigatons, GT) of the annual carbon flux between the atmosphere and terrestrial ecosystems. Based on preliminary estimates, application of forest management and agroforestry practices on a global scale could potentially sequester or conserve several gigatons of carbon annually (Ramani, 1995).

Agricultural systems also play a significant role in the global carbon cycle. They contain about 12% of the world's terrestrial soil carbon, and conservation of this pool is essential to sustain crop productivity and decreasing CO_2 emissions. Many agricultural practices have also been shown to increase soil carbon content by increasing carbon sequestration and/or reducing the loss of carbon. Practices such as reduced tillage, crop residue incorporation, field application of manure and sludge, and rotations using cover crops or leguminous crops store more carbon than conventional technology (Buen, 1991).

In this light, activities which are geared towards wood energy production, conversion and utilization would impact on the process of carbon sequestration by the trees. The amount/quantity and rate of carbon lost/emitted to the atmosphere depends on the method of production, conversion, and utilization of the trees for wood energy purposes.

In the past, a number of studies analyzed the potential role of forests for sequestering carbon. These analyses have emphasized the major forest regions on a continental basis, especially within tropical latitudes. Though preliminary, these analyses have shown that forest and agroforestry establishments and management appear to have significant promise for contributing to global carbon sequestration and conservation.

f. Microclimate

The creation of gaps on a formerly closed canopy is the most obvious change as a result of tree removal, whether it is for fuelwood, for timber or for farming. The canopy serves as an insulator to incoming solar radiation, absorbing part of it for photosynthesis and transmitting only a little to the forest floor. Cutting a tree or its branches for fuelwood reduces the insulation effect. The microclimate will be like that in the open if fuelwood extraction is by clear-cutting. This remains for a long time if the species cut do not coppice and die shortly after cutting and if there is no replanting.

A tree in the savanna vegetation in Carranglan, Nueva Ecija, before it is cut for fuelwood, allows only 3,200 to 8,000 foot-candles of light intensity. That spot immediately will be flooded with light intensities from 8,100 to 8,800 foot candles after cutting. Corresponding differences in air temperature, soil temperature, and relative humidity are thus also to be expected. For example, air temperature would be 3.9 degrees centigrade more, soil temperature would be 2.2 degrees more, while relative humidity would drop 1.9% lower. The figures plugged into the scenario were based on the measurements of microclimate in savanna grassland at Carranglan, Nueva Ecija within and outside tree clumps (Sajise and Tupas, 1976).

The limb and canopy of the forest serve as effective barriers to wind. Richards (1952) citing the work of Freise (1936), showed that wind blowing at the speed of 2.3 meters/second travelling 5 m above the ground at a distance of 150 m outside forest is slowed down and reduced to a speed of 0.5 m/sec 100 m inside forest. At about 1,000 m inside the forest, wind speed is negligible.

Therefore after cutting a stand for fuelwood, the spot will be exposed not only to higher light intensity, air temperature and very low relative humidity but also to increased windiness. All factors combined will increase the evaporation rate on the spot under consideration. This means less water on the spot and this difference can reflect on the water yield of the watershed in which the spot is included. More demand for fuelwood means there would be more such spots and there would be less water for the watershed.

It is to be noted that the same number of trees cut for any given area may not necessarily impart the same microclimatic impact. Dispersed cutting of trees as against clumped cutting of trees provide different results. Imagine 10,000 trees in a hectare spaced at 1 x 1 m, cutting 5,000 trees by clumped cutting would expose half of the hectare-land to full solar radiation, high wind velocity and low relative humidity, hence high evapotranspiration rates. Now, consider cutting the same number of trees but spread over the hectare land. In other words the trees cut are isolated from one another and thus microclimate change is not so severe.

2. Off-site Environmental Impacts

Water yield and flow patterns may change with the decrease of forest cover in a watershed. A good example of what happens when a forested watershed is subjected to indiscriminate kaingin farming is that observed in Barangay Maypalig in Batac, Ilocos Norte. From 1.33 li/sec in 1977, the river became intermittent without any dry flow in 1980 (Bengyawan, 1980; Mendoza, 1980). Baconguis and Jasmin (1980) observed that the dipterocarp and mossy forests yielded 55 and 294% more water than grasslands. The proportions for mean annual streamflow to mean annual rainfall were 18, 27 and 63% for grassland, secondary dipterocarp and mossy forest watersheds, respectively. Conversion of forests into other land uses aggravated low or dry season flow in Malaysia (Daniel and Kulasingan, 1975). Peak storm run-off per area was doubled when natural forests were converted into rubber and oil palm plantations and the corresponding low flows were halved. The 150 km^2 Maasin River Watershed in Bulacan, yielded low flows in the order of 100 to 500 li/sec prior to 1958 and, according to David (1978), rapid land use transformation was responsible for the decreasing low flows until during the dry months of 1969 and 1971, the river completely dried up. Finally, David (1984) related the impacts of land use on the low flows of small and medium-sized river basins. Estimated dependable flows per unit catchment area were lower in watersheds which had less forest cover and instead had high percentages of badly denuded (savannah) lands (DAP, 1992).

Floods during peak storms and drying up of rivers during the dry season are phenomena that are clearly due to deforestation. Deforestation, however, is mainly caused by the combined activities of logging and kaingin. Fuelwood production follows the wake of these activities in the form of gathering logging waste and/or cutting of kaingin residuals. As a secondary activity, therefore, fuelwood production has a minimal role in the hydrologic impairment of the watershed. Road construction, felling and yarding of logs, clearing and burning of forest, and cattle ranching are the primary activities which destroy watersheds.

3.3 Social Impacts of Wood Energy Production

A. Employment/Livelihood Opportunities

Wood fuel flow systems generate considerable employment. Data on this matter however, are still limited, thus its impacts are not properly accounted for although many families find employment and/or livelihood opportunities in producing, transporting and marketing these fuels to the various consumers (wholesalers and retailers).

The study on the supply systems of six urban areas commissioned by DOE-NCED, provided some data on the amount of wood gathered and charcoal produced by individual households. This information has been combined with estimates of national urban fuelwood and charcoal demand to estimate the number of households engaged in wood gathering, charcoal making, and wood and charcoal trading in rural areas. It was estimated that 536,000 households are engaged in gathering and selling wood: 158,000 households make and sell charcoal (excluding households who make cocoshell charcoal) and 40,000 households act as traders in rural areas. Almost all of these households have other main occupations. In rural areas, this is mainly farming and the traders are mainly shopkeepers or market stall operators selling wood and charcoal as part of a range of goods (Arriola).

The survey found that the urban-fuel markets provided an average of 40% of the total cash income of these households.

B. Health

Another recent finding on the impact of fuelwood production systems is related to the health of fuelwood users. The combustion of biomass fuels in any form (fuelwood, agricultural residue or animal dung) invariably generates polluting gases and particulate emissions which have direct impacts on human health. Since such combustion takes place mostly for cooking indoors, the most affected are the women and children. The social and economic penalties of indoor pollution can be severe. For instance, the disproportionate effect of pollution on women raises questions of gender discrimination even though the role of women in households remains consistent with traditional social values. At an economic level, poor health would mean low productivity, for men and women alike, apart form the additional burden of medical treatment on disadvantaged populations. When these effects are combined with the general scarcity of resources in rural areas, they add to human deprivation (Ramani, 1995).

C. Energy Supply

Wood fuel production on a commercial scale is an opportunity to provide low-cost energy to low-income members of society. This is especially true not only in the rural areas but also for low income urban areas where the people can not afford to purchase or take advantage of conventional energy sources such as gasoline, kerosene and LPG.

3.4 Issues and Constraints

a. There is a dearth of data on the actual impacts of wood energy production, conversion and utilization, not only on the environment but on other aspects as well.

b. There is a lack of appreciation of the role wood energy plays in the economy and the environment which subsequently leads to a reduced emphasis on energy development in planning and policy formulation.

c. Fuelwood resources are undervalued which results in the over-exploitation of the natural resource base.

d. The gathering, production and use of fuelwood is unregulated.

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4. WOOD FUEL FLOWS IN SIX URBAN AREAS OF THE PHILIPPINES

by

Ms. Felicisima V. Arriola

4.1 Introduction

Woodfuels are widely used in urban areas of the Philippines. These fuels are supplied from the surrounding rural areas and are used in the household sector and by a variety of small enterprises such as bakeries, restaurants and food processing industries. Until relatively recently, little was known about the organization and operation of this supply system. Then the Office of Energy Affairs - Non-Conventional Resources Division (OEA-NCRD) and the Department of Energy - Non-Conventional Energy Division (DOE-NCED) carried out a series of studies on the supply systems of six urban areas of the Philippines.

This paper presents the available results of the research conducted between August 1989 to August 1990. The studies aimed to determine the sources of traded wood fuels, patterns of distribution and consumption, market mechanism for distribution from the rural areas to users in the urban areas and trading problems.

The University of the Philippines at Los Baños - Forestry Development Center (UPLB-FDC) was contracted to prepare a methodology and survey instrument for the supply studies and to conduct the urban supply surveys in Metro Manila.

Aside from Metro Manila, several urban areas needed to be investigated. Thus the survey instruments and methodologies prepared by UPLB-FRDC were also used by the various Affiliated Noncon Energy Center (ANECs) to conduct the same study for their respective areas of coverage. The ANECs are strategically located colleges and universities which act as the technical extension arm of NCED in the promotion of new and renewable energy systems. Five ANECs were involved in this study, namely the Don Mariano Marcos Memorial State University (La Union), Isabela State University (Santiago), University of San Carlos (Cebu City), Visayas State College of Agriculture (Tacloban) and Xavier University (Cagayan de Oro). Results of four of these studies are available and the socio-economic and environmental impact of these supply systems will be discussed in the succeeding part of this paper.

Three main groups of actors have been investigated, namely:

1. Fuelwood gatherers and charcoal markers - those who extract the fuels from the rural environment and for charcoal makers to convert to a more convenient form. Most are farmers for whom fuel gathering is a sideline activity undertaken to earn additional cash income.

2. Rural traders - those who purchase the fuel from the first group, i.e. fuelwood gatherers/ charcoal markers and, in most cases, transport it to the urban areas in either their own or hired transport.

3. Urban traders - mostly small retailers who operate shops or market stalls. They sell wood or charcoal alongside other goods.

These categories are not discrete and the market chains discovered in the studies are not simple. For example, many rural traders also gather fuel or make charcoal; some gatherers sell the fuel directly to urban traders; there can be several stages in the market chain in the city (with large wholesalers selling to smaller retailers), and so on. Similarly, in some areas logging and sawmill residues are important sources of urban fuelwood, linking the supply system to these industries.

Despite these complications, the information collected in the studies permits some clear conclusions on the following issues:

1. the main sources of the wood used to supply urban fuel markets, including how these vary in different regions;

2. the actual and potential environmental impact of urban fuelwood and charcoal markets;

3. the economic significance of fuelwood markets for the rural supply areas, including the number of people involved and the contribution the trade makes to their household income;

4. the efficiency of the operation of these market systems; and

5. the sustainability of fuelwood and charcoal as urban household fuels including preliminary estimates of the scale at which supplies of these fuel can be sustained without serious environmental implications.

4.2 Findings of the Studies

The following sections summarize the main results from the four cities, namely Metro Manila, Cebu City, Tacloban and Cagayan de Oro. These four areas are representative of different size cities and of different resource positions in the regions surrounding them.

Metro Manila is the Primate City of the Philippines and has a very different household energy consumption pattern from other urban areas in the country. Cebu City is located in a region which has a few forest resources left, and is a representative of the more densely settled regions of the Visayas and Luzon. Tacloban is a small city in the Eastern Visayas and is close to both densely settled areas of Leyte and the substantial forest of Samar. Cagayan de Oro is smaller and is in a region with more plentiful forest resources.

Cagayan de Oro

Uses of Traded Fuels

Cagayan de Oro is a city of approximately 430,000 people in Misamis Oriental province of Region X on northern Mindanao. Total annual fuel consumption in Cagayan de Oro is estimated to be approximately 82,000 tons of fuelwood and 7,000 tons of charcoal.

The majority of fuelwood resources goes to households, urban traders, and commercial establishments such as bakeries, restaurants and eateries.

If these total consumption figures for fuelwood and charcoal stated above are translated into LPG demand, simple calculations would indicate that a total of US$ 0.73 million or P21.87 million as foreign exchange savings are realized (1989 prices) by this fuelwood use.

Apart from these savings, fuelwood is considered as a source of income for many of the households. The wood gatherers interviewed collect an average of 4.9 tons per annum, which would suggest that around 17,000 household gain income from supplying wood to the city's market.

Almost all of the charcoal produced in this area is coconut shell charcoal and an estimated 70 percent of it is not used as fuel. There are two companies in Cagayan de Oro who purchase coco charcoal and ship it out for industrial use as activated carbon. This is an important local industry, providing a regular source of income to a large number of poor households. The charcoal makers' income from charcoal (including that sold for activated carbon) amounts to about 50 percent of their cash income (with most of the rest coming from farming).

Supply of Traded Wood Fuels

Wood from private land made up 38 percent of the total supply, including some coconut fronds. Government forest land is the source of 29 percent of the wood, but most of this consists of residues from logging activities. A further 29 percent of the wood sold in Cagayan de Oro is residue from the city's sawmills, which is sold directly to urban dealers or large consumers such as restaurants. The remaining 3 percent is driftwood collected from the seashore. As such, the supply of the wood to Cagayan de Oro is strongly tied to the region's logging industry.

The rural traders act as intermediaries between the gatherers and the urban market. Most are small, dealing with an average of 9.7 tons per year, and many are part-time operations. The urban traders are mostly small stallholders or shopkeepers who sell other household goods, but there are a number of large traders who deal in large quantities of wood from the sawmills.

Cebu

Uses of Traded Fuels

The island of Cebu is in the central Visayas in Region VII. It has a populations of 2.5 million, 40 percent (1 million) of which live in urban areas. The urban fuelwood consumption is approximately 180,000 tons per year and charcoal consumption is an additional 15,000 tons per year.

Overall, it appears that the commercial sector accounts for 49 percent of charcoal consumption and 37 percent of fuelwood consumption in Cebu City. The rest is being utilized by the household sector. The commercial sector is also somewhat less dependent on primary fuelwood than the residential sector, with certain commercial end-users such as eateries, food vendors, and various industrial establishments making extensive use of coconut fronds and scrap wood. Aside from households, charcoal is used primarily by barbecue and *lechon* vendors, restaurants and bakeries. Much of the charcoal sold in Cebu is reportedly used for ironing and is not an important cooking fuel.

With utilization of these resources, an estimated total of around 43,000 barrels of oil equivalent amounting to US$0.73 million or P22 million at 1989 prices is saved in terms of foreign exchange.

About 30,000 households are engaged in wood gathering in Cebu. Wood gathering is an important source of income, with earnings averaging over P 3,500 per year or about US$ 135.00. This is about 40 percent of total cash income for those households. There are around 2,000 rural wood traders in Cebu City and many of them employ laborers.

Charcoal is not widely used in the urban areas of Cebu; the average household consumption is less than 5 kilograms per month. Charcoal making is a supplementary activity for farmers. They receive around P 5,000.00 per year or about US$ 417.00, which represents more than 30 percent of their total cash income.

Supply of Traded Fuels

The wood supplying the urban market comes primarily from agricultural areas, with "village woodlands" (trees on farms and small patches of woodland scattered throughout the agricultural landscape) providing 66 percent of the total supply. The remaining 34 percent or 60,000 tons of fuelwood is reported to come from the forest land, although this includes vestigial woodland patches outside the main forest areas.

The fuelwood gatherers mostly sell to rural traders, who are substantially bigger operations. The traders transport the wood to the city where they sell it on to urban traders, wood-using industries or households (Figure 1).

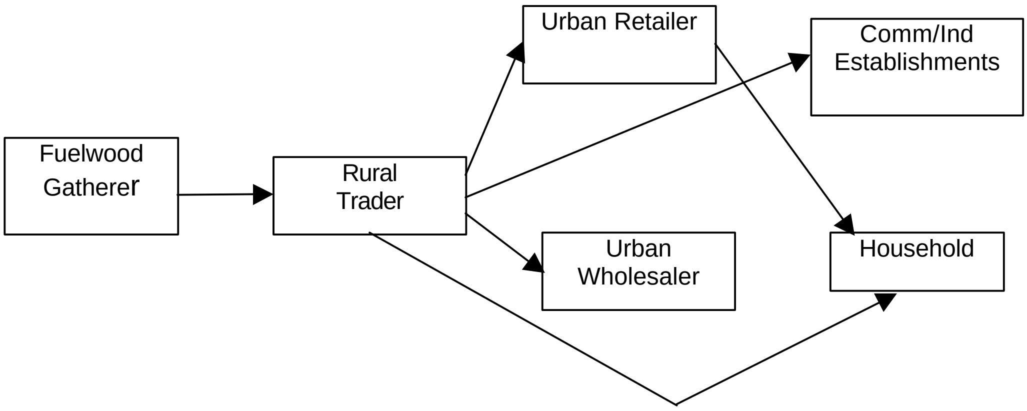

Figure 1. Fuelwood supply system in Cebu City

The fuelwood gatherers sell goods to rural traders who are again larger enterprises. They usually pay the transport costs and sell to the small urban traders. The final retailers are small shops and market stalls.

Metro Manila

<u>Uses of Traded Fuels</u>

The fuelwood and charcoal markets of Metro Manila differ from those of other urban areas in a number of important ways. Firstly, wood and charcoal are not important fuels in the National Capital Region, supplying less than 10 percent of the energy used for cooking. Secondly, the distances over which the fuels are transported are far greater than those of other regions of the country (and include a significant inter-island trade from Mindoro and elsewhere). Thirdly, commercial alternatives, especially LPG, are more readily available and are cheaper than in other parts of the country. Finally, the population of Manila is more prosperous and, in many cases, more cosmopolitan than that of other urban areas.

Total fuelwood demand in Metro Manila was estimated to be less than 60,000 tons and charcoal demand was less than 50,000 tons in 1989. The total quantity of wood used (including that used to make charcoal) is estimated to be approximately 350,000 tons per year; a quantity which is small compared to the resources of the regions which supply the city. As such, there is no reason why existing levels of wood and charcoal cannot continue to be supplied to Manila for as long as a market exists in the city, although localized impacts of the demand (for example, on mangrove areas) may need to be addressed.

The majority of the fuelwood supply in Metro Manila (43 percent) goes to industries and commercial establishments such as bakeries, restaurants, textile factories, etc. Another 21 percent of fuelwood supply goes to local fuelwood agents or the middlemen. The remaining 36 percent is distributed to wholesalers/retailers and households.

Charcoal supply is distributed among retailers (30 percent), traders (23 percent), households (21 percent), industries (11 percent) and transporters (8 percent). The remaining 7 percent is intended for non-fuel uses, i.e., for orchids and activated carbon.

Overall, the 1989 woodfuel consumption in Metro Manila is equivalent to around 80,000 barrels of oil, worth an estimated US$ 1.32 million or 40 million at 1989 prices.

Supply of Traded Wood Fuels

Wood fuels supplies in Metro Manila are reported to come from all over Luzon and the surrounding islands, but southern Luzon (in particular Quezon Province) is one of the most important sources of supply. The fuelwood gatherers that supply Manila tend to sell larger quantities than those in other areas. These primary producers sell to rural traders who are frequently locals who in turn sell to transporters or urban-based wholesalers (Figure 2).

Higher prices were reported in Mindoro, a province in Luzon. This appears to reflect the premium price paid for large stems of mangrove wood, which is reported as supplying commercial consumers such as bakeries and restaurants in Manila. The scale of this trade is unknown, but it is a cause for concern as the extraction of fuelwood from mangrove areas is a contributing factor to the rapid deterioration of mangroves found in islands such as Mindoro.

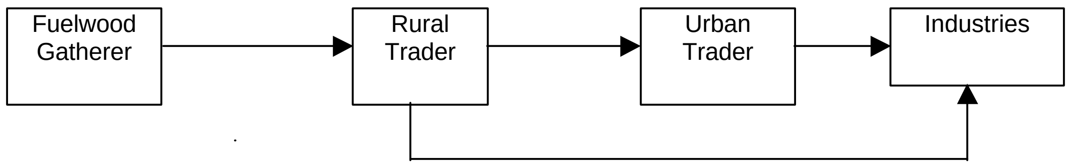

Figure 2. Fuelwood supply system in Metro Manila

The charcoal makers supplying Manila pass the goods to the rural traders and then eventually to the transporters (Figure 3).

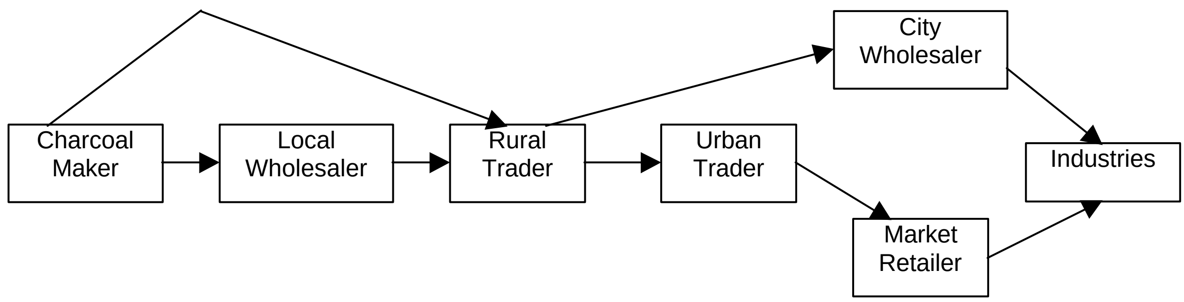

Figure 3. Charcoal supply system in Metro Manila

Tacloban

Uses of Traded Fuels

The 1990 population of Tacloban, the capital of Leyte is estimated to be 170,000. It is one of the principal towns of the Eastern Visayas and is the administrative center for Region VIII. Total annual fuelwood consumption in Tacloban is estimated at 61,000 tons, with charcoal consumption estimated at 5,000 tons.

Households utilize a major share of fuelwood supply in Tacloban City, accounting for 49 percent, retailers (36 percent) and commercial establishments such as bakeries and restaurants (17 percent). The other 9 percent goes to wholesalers.

Woodfuel traders are considered an important income source in Tacloban City. The fuelwood gathers collected an average of 4.4 tons per year, which would suggest that close to 14,400 households, i.e., 46 percent of the total households, are involved in fuelwood collection to serve Tacloban's market.

The rural traders are fairly small-scale operations, purchasing an average of 12.8 tons per year. Fuelwood trading is a secondary activity for all of the traders interviewed, with farming and shopkeeping the principal sources of income for most of them. Almost all of the urban traders are small shopkeepers or stallholders in the market who sell wood as one of a number household items.

Charcoal is of minimal importance as a household fuel in Tacloban, with an average consumption of 30 kilograms per year. This is mostly used for ironing or specialized cooking. There are considerable quantities of coco shell charcoal made in this region for export as activated carbon for industrial use.

Using 1989 prices, foreign exchange savings generated from the consumption of these wood fuels amount to US$0.24 (P7.36 million) or 14,700 barrels of oil equivalent.

Supply of Traded Wood Fuels

The supply of fuel wood in Tacloban City principally comes from two municipalities in Samar-Basey and Sta. Rita, and two municipalities in Leyte-Cabatngon and San Miguel. Fuelwood coming from Samar is brought to Tacloban either by boat or by public utility vehicles via the San Juanico Bridge. Fuelwood from the two municipalities of Leyte is brought to Tacloban by public utility vehicles only.

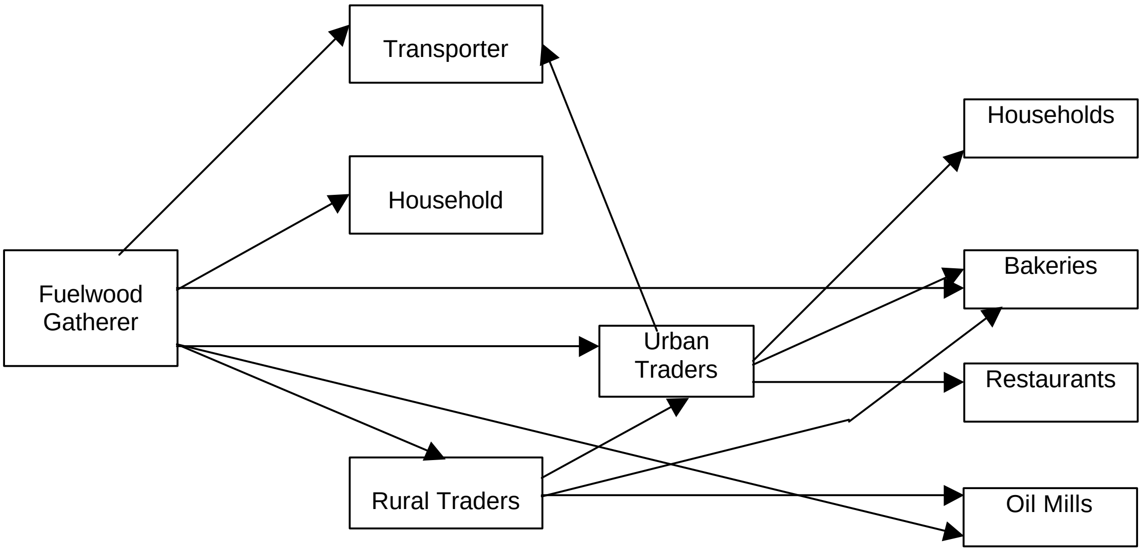

Figure 4. Fuelwood supply system in Tacloban City

Fuelwood from these four sources is collected from family woodlots (47 percent), lands belonging to landlords (26 percent), nearby public forests (21 percent) and mangrove areas (6 percent). Few of the respondents interviewed reported that they collected mangrove wood, but field observations in Tacloban's markets found quantities of mangrove for sale and the remaining mangrove areas of both Leyte and Samar appear to be an important source of fuel for the urban market.

Figure 4 indicates the flow of fuelwood from the gatherer to the users. Fuelwood gatherers sell the bulk of the fuelwood collected to the transporters, households in the locality, and rural traders in the locality. However, some fuelwood gatherers sell fuel wood directly to urban traders, bakeries and oil mills in Tacloban City.

Transporters sell only their purchased fuelwood to urban traders in Tacloban City. Rural traders on the other hand, sell the fuelwood purchased to urban traders, bakeries, restaurant and oil mills in Tacloban City.

Urban traders then sell their purchased fuelwood to household, bakeries and restaurants in Tacloban City. The end users of the fuelwood are the household bakeries, restaurants and oil mills in Tacloban City.

There are two supply systems for charcoal in Tacloban. This is because there are two types of charcoal supplied, namely cocoshell charcoal and wood charcoal.

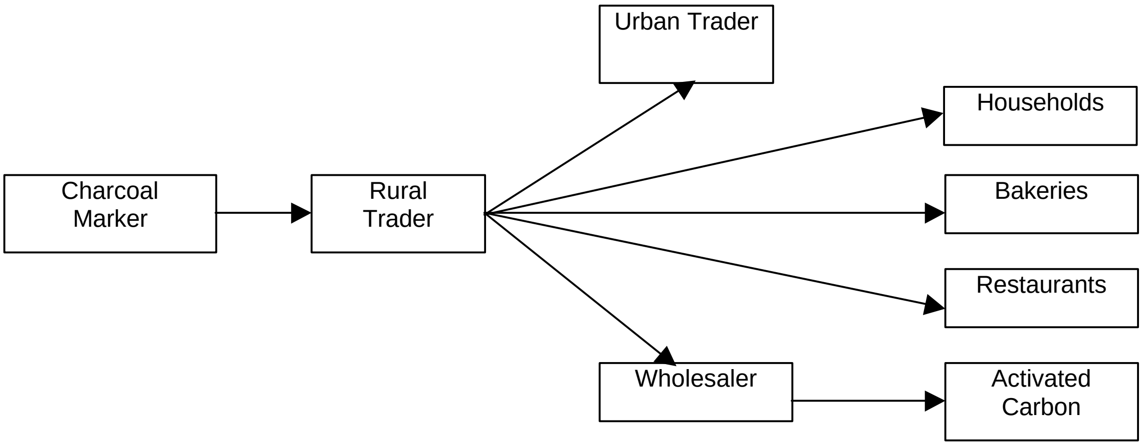

Figure 5. Cocoshell charcoal supply systems of Tacloban City

The flow of cocoshell charcoal from the makers to the users is summarized in Figure 5. Cocoshell charcoal makers sell their charcoal to rural traders. Some of these rural traders also produce their own cocoshell charcoal. The rural traders then sell their cocoshell charcoal to urban traders/retailers and wholesalers in Tacloban City. However, some rural traders sell charcoal directly to households, bakeries and restaurants. Urban traders/wholesalers sell their purchased cocoshell charcoal to household and bakeries. Wholesalers sell directly their cocoshell to activated carbon processing companies outside Leyte. The ultimate users of cocoshell charcoal are bakeries, households, restaurant and activated carbon industries.

The Wood charcoal supply system, on the other hand is much simpler. Wood charcoal makers sell their wood charcoal directly to urban traders and restaurants in Tacloban City. The urban traders then sell their wood charcoal to households, roasted chicken stands, and some restaurants.

4.3 Wood Fuel Supply Systems: A Summary

The foregoing sections are taken from the main findings of four of the detailed market studies undertaken by the NCED in cooperation with the different ANECs. The results of these surveys, along with some preliminary findings from the other two, permit us to identify a series of important conclusions concerning commercial wood fuel supply and demand in the Philippines.

Sources of Fuelwood

The sources of wood used to supply these markets vary greatly from one region to another. Government forests are important source of these materials, but there are a number of other sources and the impact of these markets on the forest resources is less severe than expected at the outset of this study.

Residues from logging and sawmills are important sources of fuel in areas where these activities continue to operate, representing an efficient and economic use of a resource which would otherwise be wasted. If logging activity ceases there will be a need to develop alternative sources which can be managed on a sustainable basis in regions which use logging residues.

Village woodlands in agricultural areas (including the mixed extensive farming areas on designated forestland in the uplands) are an important source of fuel in most regions. They provide a source of income for farming families and are intensively managed in some cases. However, little is known of village or farm woodfuel management practices in the upland areas.

Environmental Impacts

There is a little evidence from the survey to suggest that these resources are under significant pressure, but they play a vital role in the household economy of rural areas and there are indications that the management of these areas should be significantly improved.

Both upland forests and mangrove woodlands are sources of urban fuelwood in many areas. The extraction of wood resources for commercial fuel markets does give some cause for concern in regions which are less well-endowed with forest resources, are easily accessible, especially by boat, and provide wood which is considered to be excellent for fuel, in particular by informal sector commercial fuelwood users such as bakeries.

Mangroves are degrading rapidly, and urgent action to protect them is needed. Action to mitigate the effects of fuelwood extraction is part of this wider need for better management of the mangrove resources, and should be approached from this perspective.

Economic Significance

The fuelwood and charcoal supply industries are extremely important sources of income for many rural households. The supply studies provided data on the amount of wood gathered and charcoal produced by individual households. This information has been combined with estimates of national urban fuelwood and charcoal demand to estimate the number of households engaged in wood gathering, charcoal making and wood and charcoal trading in rural areas. It is estimated that 536,000 households are engaged in gathering and selling wood, 158,000 make and sell charcoal (this does not include those households who make cocoshell charcoal for activated carbon, a major rural industry in some areas) and 40,000 households act as traders in rural areas. An additional estimated 100,000 households are urban traders. Almost all of these households have other main occupations. In rural areas this is mainly farming and the traders are mainly shopkeepers or market stall operators, selling wood and charcoal a part of a range of goods.

As such, close to 10 percent of all rural households receive income from selling wood or charcoal. The survey found that the urban fuel markets provided an average of 40 percent of the cash income for these households. Many were poor households with few alternative sources of off-farm income, and for them the urban fuel trade is a vital component of their household economy.

Efficiency of Operation

Wood and charcoal markets operate totally outside the formal regulatory mechanism of the state. They are classic informal sector activities, a characteristic which is reinforced by the formal illegality of so much of the industry. The supply studies indicate that they operate efficiently to link fuelwood resources with urban markets, and do so without utilizing significant quantities of capital. The lack of price variation indicates that supply systems appear to be flexible and responsive to consumer demand. Informal markets such as these expand or contract according to the level of demand for the fuels, and in particular are able to increase supplies to make up for any potential shortfall in the availability of the non-biomass alternatives. This is particularly true for urban areas outside Metro Manila, where wood and charcoal are still the main fuels and the market structures are most fully developed.

Sustainability of Fuelwood and Charcoal

The analysis of the biomass situation in the Philippines indicates that the overall national picture for these fuels is extremely favorable and there is no immediate cause for concern about widespread wood fuel shortages for the household sector. There is, however, clear evidence of poor management and possible over-exploitation of mangrove and upland resources in some areas.

As determined by this study, woodland plots in agricultural areas are vital energy resources but little is known about the efficiency of their management or how management can be improved. The basis for this improvement will be through some form of community-based venture with the specific techniques used varying from place to place. An investigation of the management of woodland plots should be an explicit focus of these studies. In general, the way the government could assist farmers to manage the resource base, by providing training and extension to farmers, establishing improved seed supply sources, giving farmers long term leases or tenure, introducing them to improves tools and possibly increasing their monetary reward.

Any of these interventions will therefore require detailed study and coordination between the agencies responsible for the management and use of the renewable resources base, namely the Department of Environment and Natural Resources, the Department of Agriculture, and the Department of Energy.

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5. FUELWOOD MANAGEMENT STUDY OF SAGADA AND BESAO, MT. PROVINCE

by

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John F. Malamug, and Edgar M. Molintas

5.1 Abstract

The Fuelwood management study of Sagada and Besao was conducted from August to December, 1996. It comprised: (1) Interviews with key informants; (2) the use of structured questionnaires; (3) a timber inventory; and (4) regeneration potential studies.

Fuelwood is gathered free in the area. Wood cut from the communal/clan forest does not exceed the allowable cut in relation to the indigenous understanding of carrying capacity. This practice insures the sustainability of the forest resources in Sagada and Besao. Trees from communal/clan forests are selectively cut and converted into two feet long cords. These cords are then chopped into smaller pieces, dried and stored for household consumption. Fuelwood collection by children is confined to fallen twigs and branches. Since fuelwood is free, this is not sold. One modification however is that old people who cannot collect wood on their own, hire younger people to bring it to their houses. Despite the availability of alternate sources of energy (LPG, kerosene, etc.), fuelwood is still preferred for cooking.

The forest cover of a communal and clan managed forest is well stocked, the inventory of a selected clan forest shows that the forest has a stocking density of 595.63 cubic meters per hectare. Regeneration potential studies showed that the number of seedlings per plot surveyed ranges from 54-342 based on diameter classes and 39-474 based on height classes. This finding supports the claim that Benguet pine management in Sagada and Besao is sustainable under communal/clan management.

The recognition of the vital role of the forest to the people's survival contributed to the forest conservation efforts in Sagada and Besao. This is supplemented with a municipal ordinance that provides penalties for forest fires and illegal cutting. The unwritten communal and clan regulations complement forest protection activities. The community and the clan strictly follow these unwritten regulations.

Some uses of wood other than for fuelwood are: bonfires, food preservation, drying agricultural crops/products, insect control, space heating and rituals. Charcoal is not produced directly but as a secondary product of cooking. Charcoal is segregated while cooking, this is used to keep food and the immediate area warm.

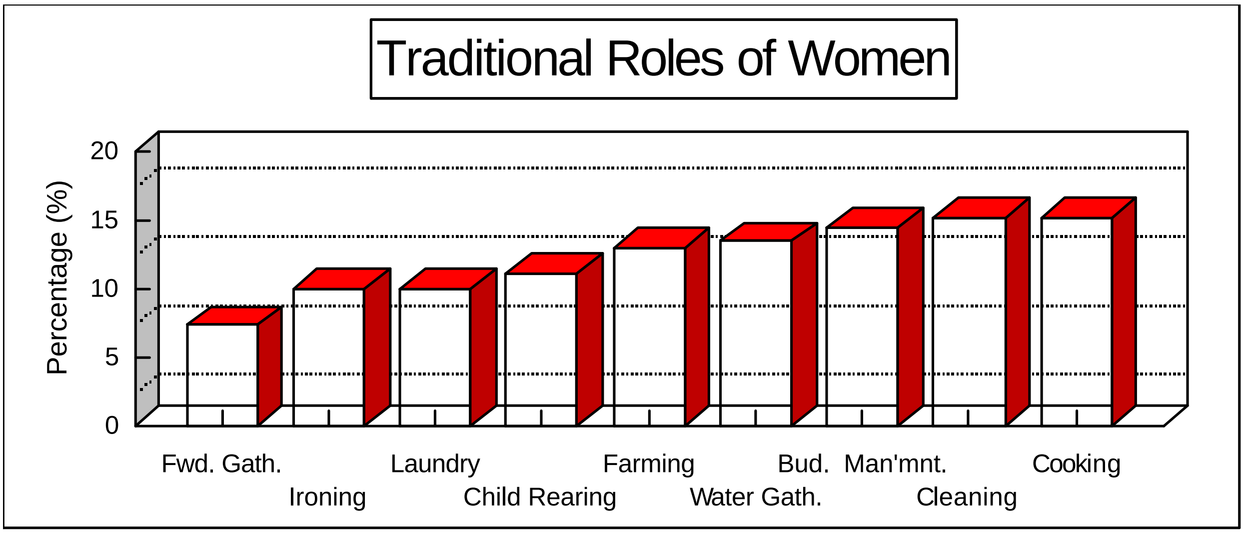

Figure 1. Traditional roles of women in the community

5.2 Fuelwood and Rituals

Wood has a strong link to the culture of Sagada and Besao because the people there use wood for their rituals. These rituals are pagan practices which have survived the trials of time. They are practiced by the old folks of Sagada and Besao who believe that they will gain the favor of a Supreme Being, "Kabunayan", by performing these rituals. During their rituals they offer pigs and chickens. They slaughter these animals and a seer "MANSIP-OK" reads the liver of the dead animals. If the liver shows sign of bad luck, another pig/chicken is slaughtered until a liver with a good sign is obtained. Wood dependent rituals can be seen on Table 1. The table shows that there are six wood dependent rituals. The amount of wood used in these rituals varies depending on the purpose, unfortunately the researchers were not able to determine the amount of wood used per ritual. The number of animals slaughtered depends on the economic status of the community/individual holding the ritual.

Table 1. Wood dependent rituals

Month												
Ritual	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
BEGNAS	■			■	■	▌						
UBAYA	▐										▐	▐
APOY			■	■								
DAW-ES	■	■	■	■	■	■	■	■	■	■	■	■
SENGA	■	■	■	■	■	■	■	■	■	■	■	■
BABAYAS	■	■	■	■	■	■	■	■	■	■	■	■

"Begnas" – is a ritual for thanksgiving after rice planting. It also serves as a blessing for the crops planted. In this ritual, a native pig is slaughtered. The pig is cooked by boiling. After cooking, the pig is chopped into small pieces and distributed to those present during the ceremony. This ritual is done during the months of November, December and January, the months when rice is planted.

“Ubaya” - is ritual conducted during rest days. Usually a native chicken is slaughtered by beating it continuously with a stick until the chicken dies without any bleeding taking place. The chicken is prepared by burning the feathers, chopping the chicken into small pieces and boiling in water. This ritual is conducted during the months of January, November and December. This ritual is also conducted during funerals, and when someone in the community dies.

“Apoy” – is a ritual conducted right after the rice panicles have developed. This is a ritual of blessing so that there will be a good harvest season not only for rice but also for the other crops. In this ritual they slaughter a pig in the same manner as in the “BEGNAS”.

“Senga” - is a ritual conducted to bless a sick individual so that he will get well soon. In this ritual 2 pigs are slaughtered and prepared in the same manner as in “BEGNAS” and “APOY”. This ritual is conducted at any time of the year.

“Daoes/Daw-es” - is a ritual conducted to ward off a bad spirit or bad luck. This is conducted by an individual when he has “inflicted injury to” or “caused the death of” a community member or suffers from spells of bad luck. In this ritual a chicken is slaughtered and prepared in the same manner in “UBAYA”. This ritual is conducted at any time of the year.

“Babayas” - is a ritual conducted during wedding ceremonies. Usually food is cooked to feed the community. This ritual is conducted at any time of the year.

These rituals are conducted by a seer known as “Mansip-ok”, his job is to bless the slaughtered animals and see if the offering is acceptable to the gods. He does this by ‘reading’ the liver of the animal. The ability to read livers is a gift which is passed on from generation to generation. If the liver reading does not show a good sign, another animal is slaughtered until a good reading is obtained. The clan or community members participate in these rituals and get a share of the slaughtered animal.

Conclusion

The significant findings of the study were:

1. The main source of cooking fuel in Sagada and Baseo is wood followed by LPG and kerosene. Wood appears to be the main source because it is readily available and free. LPG and kerosene, although more convenient, are obtained 150 kilometers away.

2. Most barangays in Sagada and Baseo are electrified. The energy preference for lighting was electricity followed by kerosene, candle and wood. Wood was used for night travel. Electricity is preferred because it most convenient to use in the night.

3. With most of the barangays in Sagada and Baseo electrified, recreational and practical energy consuming devices present were found to be radios, televisions, refrigerators and electric irons.

4. The forest of Sagada and Baseo is managed through a communal/clan system which appears to be effective and sustainable because of their indigenous knowledge of carrying capacity which cautions them not to over-exploit their forest.

5. Fuelwood is gathered for free in the community/clan forest. A modification is when old folks pay for the services of gathering and delivering wood to their homes. Male children gather fallen twigs and branches on their way home, while their fathers selectively cut the larger trees for fuelwood.

6. The forest cover of Sagada and Baseo has good stocking; the timber inventory conducted showed that the average volume per hectare was 595.63 cubic meters.

7. The other uses of wood aside from cooking are for bonfires, insect control, household lighting, night travel and space heating.

8. The regeneration potential studies of the Benguet pine trees in Sagada and Baseo revealed a high regeneration potential implying that as long as the young seedlings are protected the sustainability of the trees will not be a problem.

9. The benefits provided by the communal/clan forest in Sagada and Baseo were water, timber, wild animals, honey, mushrooms, rattan, edible plants and orchids.

10. Municipal orders and unwritten laws on illegal cutting and burning contribute to the protection and conservation of the communal/clan forests.

11. Six wood dependent rituals were identified, these were: Begnas, Ubaya, Apoy, Daw-es, Senga and Babayas.

12. Only the traditional roles of women were identified in the survey. However, in some barangays women have important roles in forest protection. The role of women in forest resource management is underrated.

Recommendations

The recommendations of the study are:

1. A study of the role of women in forest management should be undertaken to clearly recognize and validate their role in insuring the sustainability of the forest resources.

2. The timber inventory and regeneration potential studies should be validated every two years to determine whether their management scheme is still sustainable.

3. This study should be duplicated in Ifugao, Abra, Kalinga and Apayao, to have a picture of the forest resources of CAR.

4. The results of this study should be presented to the municipalities concerned so that their system of forest management will not be abandoned.

5. The conversion from communal forest to clan forest to privately owned forest should be closely monitored because this appears to be the trend in the area.

This case study was presented by Mr. Paquito P. Untalan, in behalf of the BSU-ANEC. He is an Associate Professor at the College of Forestry – Benguet State University, La Trinidad, Benguet.

6. WOOD-BASED INDUSTRIAL COMMERCIAL ACTIVITIES AND THEIR CONTRIBUTIONS TO THE RURAL SOCIO-ECONOMY

by

Merlita P. Pacis

6.1 Introduction

La Union is located in the southwestern part of the Ilocos Region. It is bounded on the north and northeast by Ilocos Sur, on the south by Pangasinan, on the east by Benguet, and on the west by the Lingayen Gulf and the China Sea (Figure 1).

The province is composed of twenty municipalities with 576 barangays or an average of 29 barangays per municipality as shown in Figure 1.

La Union has a total land area of 149,309 hectares, only 12% of the regional total of 1,284,019 hectares.

The total population of the province as of the September 1, 1995 census was 597,442 and reached an estimated projected population of 607,716 in 1996. Most of the province's population is concentrated in San Fernando (15.37%), Bauang (9.41%), and Agoo (8.03%).

The population density for the province was placed at 400 persons per square kilometer in 1995 and 407 persons per square kilometer in 1996.

Forest Resources

The classified forest area in the province (see Figure 2) is 31,548.60 hectares distributed as follows: timberland (31,248.60 hectares); national parks, games refuges and bird sanctuaries (210 hectares); and forest reserves (90 hectares).

The province has continuously pursued a Greening Program to reforest its denuded mountainsides and hillsides. Trees are also planted along highways, rivers, backyards and irrigation watersheds. The total forest cover of the province was estimated at 3,210 hectares, reflecting only 2.15 percent of the province's land area. Furthermore, a census of forest occupants revealed that a total of 854 hectares of timberland were occupied by 577 forest dwellers. A total of 29,002 hectares are protected forest area and 3,381 hectares were reforested, namely the municipality of San Gabriel, San Juan, Santol, Sudipen, Aringay, Bagulin, Pugo, Rosario and Tubao.

Land Classification

As shown in Figure 2, of the total provincial land area of 149,309 hectares; about 71 percent or 105,104 hectares are certified A and D lands, and the rest are forest lands.

Non-Timber Forest Production

The non-timber forest production comprises charcoal, bamboo poles, firewood and boho poles. In district I, only San Gabriel is producing charcoal and firewood with 30 sacks and 30 cubic meters, respectively. In district 2, on the other hand, Aringay and Bauang are producing 100 sacks and 150 sacks of charcoal, respectively (Table 1).

Wood-based Industrial/Commercial Activities

Based on the Non-conventional Energy Systems Census in La Union, as of July 1997 the most important woodfuel-based industries surveyed were the bakery and the tobacco industries.

The tobacco industry is noted for its energy intensive curing process. It takes an average of 5 days of curing tobacco, 3 days of intensive use of fuelwood (24 hours) and takes 2 days more for allowing the barn to cool down. This will dry the leaf and fix the color of the tobacco.

Flue-curing of Virginia leaf tobacco may be considered to take place in three stages: 1) yellowing, 2) color fixing and lamina drying, and 3) midrib drying (Table 2).

In a study conducted by the Forestry Technical Service, the demand of fuelwood for the industry in 1980 was 580,000 cu m projected to 720,000 cu m for 1985.

Similarly, the consumption of fuelwood for curing the 1.07 tonnes tobacco from 714 hectares was about 15,708 cu m in 1992 (de Padua, 1992).

A total of 5,786 dryers was surveyed as of July 1997, 5,532 (96%) of which were operational and 254 (4%) were non-operational. The annual fuelwood requirement for operational dryers was 36,836,875 tonnes with 94,302.4 BFOE.

Another fuelwood consuming business surveyed was the bakery industry. There were 51 bakeries inventoried consuming 5,117 tonnes of fuelwood annually with 13.1 BFOE. This was supported by Cruz (1985) and de Padua (1992) who claimed that bakeries in Region I had an annual consumption of 44,500 cubic meters and 108,418 cubic meters, respectively.

The increasing fuelwood requirement may be due to increasing prices of oil and petroleum based fuel. This is further aggravated by the increase in human population from 597,442 in 1995 to 607,716 in 1996 for La Union. As a result, even the supply of wood is diminishing because of the depleting natural and cultured wood stands.

Almoite (1991) evaluated six fast growing tree species in la Union and Abra, namely Gmelina arborea, Leucaena diversifolia, Eucalyptus camaldulensis, Cassia spectabilis, Acacia auricuriformis and Acacia mangium. The findings revealed that the various exotic fast growing tree species could grow at comparable rates. However, planting fast growing tree species does not suggest a complete solution to the whole fuelwood crisis.

Contributions to the Economy

As shown in Table 3, as of 1995 the number of employed persons under the category “production workers” was 49,000. This may be due to the fact that the activities of bakeries comprise marketing of raw materials, preparation of ingredients, cooking, upkeeping of the area, packaging, transporting and marketing of finished products. These activities create local employment amounting to an average of 5 workers per bakery, hence they contribute significantly to the economy of the province.

In the tobacco industry, on the other hand, activities comprise land preparation, transplanting, weeding and cultivation, irrigation, harvesting, sticking and pooling, curing, classification, grading and marketing. Activities start in November and last until April. According to tobacco farmers, an average of 6 workers/hectare are employed, hence also making a significant contribution to the economy of the province.

References

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De Padua, V.M. 1992. Marketing of selected multi-purpose tree species (MPTS) products and by products.

PCCARD. 1979. Socio-Economic Profile of la Union, 1995 & 1996. The Philippine Recommendations for Tobacco.

Table 1. Non-timber forest products production sub-IAD CY 1993

DISTRICT MUNICIPALITY	CHARCOAL (Sacks)	BAMBOO POLES (Pieces)	FIREWOOD (Cubic M.)	ANAS LEAVES (kilos)	BOHO POLES (Pieces)
DISTRICT I	30	2,315	30		132,125
Bacnotan					
Balaoan					
Luna					
San Fernando					2,500
San Gabriel	30	270	30		13,500
San Juan		245			15,500
Santol					36,000
Sudipen		1,800			54,625
DISTRICT II	250	2,450			171,100
Agoo					
Aringay	100	200			55,000
Bagulin					
Bauang	150	520			
Burgos		160			
Caba		50			
Naguilian		1,330			91,700
Pugo		40			14,000
Rosario					
Sto. Tomas					
Tubao		150			10,400
LA UNION	280	4,765	30		303,225

Source of Data: DENR-Forest Management Sector

Table 2. Recommended temperature, relative humidity and duration for curing mature Virginia tobacco leaves using conventional curing procedure

Curing Phase	Condition of Leaves	Duration* (hours)	Dry-Bulb Temperature (^oC)	Wet-Bulb Depression (^oC)	Relative Humidity (%)
Yellowing	Until blades fully yellow	28-36	28-45	2-10	90-80
Color fixing and lamina drying	Until leaves on all tiers well-curled	16-24	46-60	10-18	80-30
Midrib drying	Until midribs well-dried	28-36	61-77	more than 18	30-20

*Duration of phase depends on leaf position, leaf size, leaf maturity, weather conditions and construction of barn.

Table 3. Number of employed persons, by major occupation group: 1995

OCCUPATION	NUMBER (thousands)	PERCENT
Professional Workers	16	6.2
Administrative Workers	6	2.3
Clerical Workers	6	2.3
Sales Workers	31	12.1
Service Workers	18	7.0
Agricultural Workers	131	51.0
Production Workers	49	19.1
TOTAL	257	100.0

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7. GENDER SPECIFIC ROLES IN WOOD ENERGY SYSTEMS

by

Juliet U. Texon

In developing countries, firewood is the major source of cooking and heating fuel for most rural communities and for the majority of urban dwellers. In the developing world as a whole, about 2 billion people rely solely on fuelwood for heating and cooking. It is estimated that within the next three decades, the world population will increase to 8.5 billion, of whom 7.1 billion will live in developing countries (Ndey-Isatou Njie, 1995). This large population increase will result in a corresponding increase in the demand for fuelwood and other biomass energy sources.

Wood energy development is one of the areas in which women's issues are crucial. In most, if not all countries in Asia and sub-Saharan Africa, it is the women who take care of daily fuel needs for domestic use, it is the women who work for many hours in smoky kitchens, and it is the women who participate in village woodlots or care for homegardens which supply the much needed fuelwood.

Fuelwood Production

Considering cooking as part of their reproductive cultural practice, women became the primary users of fuelwood. Their efforts to obtain supplies of this much needed material include gathering/collecting or buying it in the marketplace.

Due to their continuous use of fuelwood, women developed in-depth knowledge and know-how about various species. When it comes to the knowledge of fuelwood species, women can differentiate between those which provide quick high heat, those which provide long-lasting low heat, and those that smoke. When it comes to the management of fuelwood species, successive generations of older women have trained younger women in the art of lopping or pollarding (Martha Chen, 1993).

Rural households use a variety of biomass goods. Their collection, processing and use are often gender-specific. Women are the primary processors, driers and storers of many of these (biomass) products (Martha Chen, 1993).

In Bangladesh, by tradition, women have always been more involved in homestead agricultural production than men (C. Safilos-Rothschild and Simeen Mahmud, 1988). The wood from homesteads is the major source of fuelwood.

In one particular village in India referred to by Marlyn Hoskins, the men showed a preference for hardwood tree species for their community forestry project whereas the women preferred fast-growing softwood species. The men's purpose was to supply wood for furniture and woodcarvings for sale, while the women's purpose was to supply fuelwood and fodder for their own use. When 3,000 seedlings of hardwood species were delivered by the foresters without the knowledge of the women, all the seedlings died. When both hardwood and softwood species were delivered, with the women previously informed, the women planted and watered them all. (From Marilyn Hoskins, Gender Analysis and Forestry, in press, Sec. A,p.6.).

In El Nido, Palawan, women and children traditionally undertake fuelwood gathering (pagraraha) for domestic use. Generally, men share in this activity only when their wives are indisposed, when one of the members of the family is sick or during emergency situations. Gathering and preparing fuelwood for commercial purposes were originally tasks for both men and women. The men cut the bakauan into size while the women arranged and tied them. In charcoal making, the men cut, piled and burned the wood. Afterwards, the women gathered them. However, this activity which takes place in the mangrove area coincides with the squid season so the women and children are left to do the job while the men engage in squid fishing (from Women's Participation in El Nido Marine Reserve Project: A Case Study, by J.U. Texon, unpublished).

Traditionally, men gather fuelwood. But women, nowadays, are doing the same thing not only for domestic use but also for commercial purposes. This practice is quite conspicuous in the DENR Community Forestry Projects in Guihulngan, Negros Oriental and Quibal, Penablanca, Cagayan.

The aforementioned cases show that women play a significant role in fuelwood production. They know the art of making charcoal and they have extensive knowledge of the properties of the materials they use as fuelwood. They even exert a collective effort in influencing the decision of their community on the kind of trees to be planted and rear the plants for future benefits.

Fuelwood Energy and Human Energy

Fuelwood gathering/preparation for domestic use as well as for trading entails the utilization of another form of energy, that is human energy - the larger part of which is women's energy - in exhausting physical tasks, one of which is gathering fuelwood. Cecelski (1992) concludes that one of the most damaging concepts in conventional energy studies is the exclusion of metabolic human (and animal) energy from consideration. In the event of shortages due to deforestation, it becomes more difficult and more time consuming for rural women to collect fuelwood. Carrying loads up to 35 kilograms, they are forced to travel ever-longer distances sometimes up to ten kilometers or more, to collect the bare minimum wood needed for survival (Table 1).

Table 1. Time spent gathering fuel, early 1980s

Country	Average Hours Per Day	Explanation of Work
Southern India (6 villages)	1.7	Women contribute 0.7 hours; children contribute 0.5 hours
Gujarat, India	3.0	In a family of 5, 1 member often spends all his/her time on it
Nepal	1 – 5	Often 1 adult and 1 -2 children do fuelwood collection
Tanzania		Traditionally women's work
Senegal	4 – 5	Often is carried about 45 km
Niger	4 – 6	Women sometimes walk 25 km
Kenya	3.5	Women do 75% of the fuel gathering
Ghana	3.5 – 4	1 full day's search provides wood for three days
Peru	2.5	Women gather and cut wood

Source: World Resources Institute, World Resources Report 1994-95, p.47 (New York: Oxford University Press).

The maximum permissible weights legislated by many developing countries prohibit women from carrying loads greater than 20 kilograms. In reality, rural women carry loads of fuelwood of 25 to 35 kg and heavier, over distances of 3 - 5 km or more.

This other "energy crisis" has been widely publicized with pictures of women carrying loads of wood, and it is indeed true that fuel collection is a major responsibility for women throughout the world. But, above all, fuelwood is an essential raw material for women's most important and time-consuming activity - food preparation - which includes fuel and water collection, transportation and preparation, food processing, cooking, firetending and washing up.

All food preparation activities are affected by the availability of fuel - more time is needed to walk further afield, to gather smaller bits and pieces and to tend straw or leaf fires which require more care in order to make them last.

Activity Profile in Fuelwood Production

Women are the primary collectors of fuelwood (Table 2). This is more or less so in most agro-ecological regions. In some places, fuelwood collection away from homesteads is the work of men.

However, there are other gender groups which matter when wood energy is discussed, for instance, children and elderly people. It is known that in many countries young children bear the heavy burden of collecting fuelwood on a daily basis and it is also known that the elderly and, for instance, single-headed households often face severe problems coping with their energy needs, in addition to other burdens. Perhaps these children should be at school rather than collecting fuelwood, and the elderly deserve a little comfort.

Table 2. Activity profile in fuelwood preparation

Activity	Person/s Involved
1. Domestic Use	
- gathering/collection	FA, ma, fc, mc, fe, me
2. Commercial Use	
- selection of species	FA
- planting	FA, MA
- care for seedlings	FA
- cutting of wood into size	FA, MA
- arrange and tie	FA
3. Charcoal Making	
- cut, pile and burn	FA, MA (seasonal), mc, fc
- gathering of charcoal	FA, mc,fc

Legend: FA = female adult
MA = male adult
ma = male adult, less participation
mc = male child, less participation
fc = female child, less participation
me = male elderly, less participation
fe = female elderly, less participation

Wood Energy in the Kitchen

With roughly half of the world's population cooking daily with the traditional biomass fuels of dung, crop residues, wood and charcoal, efforts to disseminate improved, more efficient cookstoves are an ideal way to address a wide range of socio-economic and environmental goals. These goals include conserving energy, reducing time spent on collecting wood, expanding economic opportunities for both rural and urban families, empowering women, reducing harmful household smoke exposure, reducing forest clearing and ecological alteration, and mitigating global atmospheric pollution. Widespread dissemination and use of improved woodstoves has the potential to impact on each of these objectives, and thus, has been a focal point of household development and quality of life efforts for several decades.

Wood and other biomass fuels comprise 40 to 60 per cent of all energy sources, both industrial and domestic, in many Asian, Latin American and African countries. Biomass cooking fuels are often combusted inefficiently. Open "three stone" fires and some traditional stove designs generate large quantities of smoke and particulate matter, while directing only a small fraction of the resulting heat to the cooking pots. Sometimes, as little as 5 to 15 percent of the total energy content of the fuel is utilized to heat the food.

Researchers confronted with a continuing dependence on biomass fuels, traditional woodfuel management schemes and traditional cooking stoves have concluded that the introduction of improved cookstoves could have a dramatic development impact. Specific designs vary widely, but most cookstoves are made to consume less fuel per amount of useful energy delivered and/or emit less pollution, which benefits the health of the user as well as the environment. It is not surprising that there are a great many designs which are geared to meet the same general objectives:

- maximize combustion of the fuel by keeping the temperature high and ensuring the presence of sufficient oxygen;

- maximize radiative heat transfer from the fire to the pot(s) by keeping the pot as close to the flame as possible;

- maximize convection from the fire to the pot(s) with a stove design that passes as much of the hot gases over the pot(s) as possible; reduce drafts;

- maximize conduction to the food pot(s) by using an insulating material for the stove so that the heat is retained and concentrated near the pot(s); and

- maximize user satisfaction by making the stove convenient to use (with fuels, cooking pots, and utensils) and able to easily prepare local dishes well.

The fundamental role that energy management plays in family health, nutrition, economic opportunity, and environmental conservation means that improvements in cookstove technology and efforts to disseminate new technologies offer not only opportunities to climb the energy ladder, but also opportunities for positive social change.

The history of cookstove projects shows that energy efficiency is a necessary, but not a sufficient, condition for a new technology to succeed. The part technical, part social criterion of robust efficiency remains a difficult design standard for technologies and for development programmes. However, improved cookstove programs have benefited greatly from efforts to adhere to this principle by combining intensive interaction and feedback between stove designers and end-users, long project follow-up times, and greater reliance on market and commercial forces.

One important lesson from cookstove efforts to date is that choice and selection - of both technology and implementation methods - are fundamental to meeting the diverse needs of the intended end-users.

Impact of Wood Energy on Health

The connection between wood use, cooking and the epidemiology of respiratory and other illnesses is a topic of active current research. However, a consistent pattern linking energy, environment, and health has already become alarmingly clear. To evaluate how effective improved cook stoves and household energy management are mitigating harmful health effects, it is necessary to consider the entire food preparation cycle, including energy and environmental management, and household risk and economic decision-making.

The food preparation process is one of the most important health and development issues facing poor countries. Biomass cooking on traditional stoves is a major source of concentrated air pollutants, including respirable particulate matter, carbon monoxide, nitrogen oxides, benzene, formaldehyde, benzo(a)pyrene, and aromatics. Particulates seem to be the primary culprit in smoke-related illnesses. In some places, the pollutant exposure levels associated with indoor biomass burning in developing countries is many times greater than accepted health standards. U.S. standards, for example, call for a maximum particulate concentrations of 250 micrograms per cubic meter (not to be exceeded more than once a year). However, in developing countries, people are routinely exposed to much higher indoors particulate concentrations. These levels rival or even exceed the pollution levels found in the most polluted industrial cities. Women and children are particularly affected, since cooking smoke is confined to indoor settings, where they are exposed for extended periods of time.

A study in Gujarat state in western India found that fuels such as firewood, dung cakes, and crop wastes emit more Total Suspended Particulates (TSP), benzo-a-pyrene, carbon monoxide, and polycyclic organic pollutants than fossil fuels. The study showed that women are exposed to 700 micrograms of particulate matter per cubic meter (the level considered permissible is less than 75 micrograms); they inhale benzo-a-pyrene equivalent to 400 cigarettes per day. Moreover, women begin regular cooking at the age of 13, and, thus, are exposed to pollutants for a long time.

The living conditions that expose people to high levels of indoor pollution have been well documented in Africa. The majority of sub-Saharan Africans live in rural areas; Kenya, for example, is only about 20% urban. Family homes generally consist of multi-use buildings, where the same room or few rooms are used for cooking, sleeping, and working. In many cases, the total indoor volume is less than 40 cubic meters; in some (such as the Maasai homes in Kenya), indoor air volumes may be half that. Rural homes often have minimal ventilation; when people cook, they close the door or when they exit, plug the windows with cloth. Ventilation is further reduced during rainy seasons, cold spells, and at higher elevations. Under these circumstances, the pollutant concentrations resulting from cooking can easily build to unhealthy levels and remain that way over the course of the day.

High pollution levels are not limited to rural areas. The close quarters of urban slums, and even the minimal spaces sometimes allocated to household servants in more affluent households, and the heavy use of traditional cooking fuels, notably charcoal, all contribute to urban pollution. Poverty and pollution can increase the ambient pollution concentration over entire neighborhoods, where woodsmoke mixes with photochemical smog.

The extent of the woodsmoke health crisis in developing countries is beginning to gain international attention. The World Health Organization estimates that 1.5 billion people live under conditions of unhealthy air. Four to five million-childhood deaths are attributed to acute respiratory infection every year. For example, Laikipia District of Kenya is a relatively prosperous mixed agricultural and farming region. However, even here, annual morbidity data from district hospitals and clinics show that respiratory infections head the list of the most commonly reported diseases, accounting for a third of all afflictions reported and diagnosed. Eye infections, also linked to woodsmoke exposure, are on the list of top ten diseases as well.

The health hazards of dependence on biomass for cooking are not limited to those arising from air pollution. Each part of the fuel cycle has health implications that can be serious. Table 3 shows the potential health hazards arising from producing and processing fuel, collecting it, and actually cooking with it.

Table 3. Health effects of biomass fuel use in cooking

Processes	Potential Health Hazards
PRODUCTION	
Processing/preparing dung cakes	Faecal/oral/enteric infections Skin infections
Charcoal production	CO/smoke poisoning Burns/trauma Cataract
COLLECTION	
Gathering/carrying fuelwood	Trauma Reduced infant/child care Bites from venomous reptiles/insects Allergic reactions Fungus infections Severe fatigue Muscular pain/back pain/arthritis
COMBUSTION	
Effects of smoke	Conjunctivitis/Blepharo conjunctivitis Upper respiratory irritation/inflammation Acute respiratory infection (ARI)
Effects of toxic gases	Acute poisoning
Effects of chronic smoke inhalation	Chronic obstructive pulmonary disease (COPD), chronic bronchitis Cor pulmonale Adverse reproductive outcomes Cancer (lung)
Effects of heat	Burns, cataract
Ergonomic effects of crouching over stove	Arthritis
Effects of location of stove (on floor)	Burns in infants/toddlers

Source: Based on data given in World Health Organization,
Indoor Pollution from Biomass Fuel (1992), and own experience (Srilatha Batliwala)

Effects on Nutrition

In addition to the direct health effects of cooking with biomass, its growing scarcity and the difficulty in obtaining it also affects the health of the poor in indirect ways. The scarcity and high time and labor costs involved in obtaining biomass may result in measures to economize on fuel consumption for cooking by:

a) preparing fewer hot meals
   - this can lead to consumption of stale or leftover foods that may be contaminated

b) undercooking

- this can lead to health problems, particularly in the case of some pulses and oils that are toxic when undercooked

c) switching to cereal staples that require less cooking but may be less nutritious

- for example from wheat or other coarse grains to rice.

There is no documented statistical evidence for any of these problems, but they have been widely observed by grassroot workers in many developing countries.

To spend less time cooking is an extreme reaction to a fuel shortage. Over time, some regions have evolved less fuel intensive cooking and food processing methods in response to lack of fuel. These include quick frying and the processing of long-cooking soybeans into tofu in Asia. However, when fuel availability changes rapidly, it is hard to adapt. Cooking fewer meals, eating cold or reheated leftovers, more use of snacks of pre-processed "street foods" and even changing to different foods that need less cooking can all be reactions to the need to save fuel. These symptoms have been found in areas suffering from an acute shortage of fuel, such as Sahel, Haiti, parts of Mexico and Nepal. They can have serious implications for family nutrition.

Fuelwood, Women and the Economy

Women depend on biomass resources to produce food and income. Energy and environmental resources are critical for women to meet their family's basic needs, produce food and generate income. This is because women's work depends more than men's on access to energy and biomass. The most visible use of energy is fuel for cooking. The same fire is often used for space and water heating and as a center of social activities. Fires are also used for food processing and small industries such as ceramics and charcoal making which are important sources of income and employment for women.

The biomass products that can be used for fuel - wood, branches and leaves, crop residues such as straw, and dung - also have important alternative uses: straw and leaves serve as fodder for livestock; diverse tree products are used as raw materials for housing, utensils, cottage industries and food; and organic matter (dung, crop residues, or trees) maintains soil fertility and agricultural productivity. These biomass, energy, and environmental resources are substitutable and inter-dependent. They must, therefore, be regarded as forming a single system which rural people depend upon for their livelihood.

In a study at El Nido, Palawan, the women complained about the decreasing source of fuelwood for their domestic use as a result of overcutting of the mangrove. While previously the family obtained its fuelwood requirement from nearby areas for free, most households nowadays buy fuelwood or use other types of fuel.

Women's traditional income-generating activities depend upon adequate supplies of fuel and biomass. Food processing, baking, beer brewing, fish smoking, ceramics and brickmaking are a few of the energy-intensive small industries practiced by women. Pottery making in Tanzania uses up a cubic meter of wood for 100 large clay pots, which is nearly equivalent to the annual average per capita rural consumption in Africa. Fish smoking uses 0.8 cubic meters per ton, and brickmaking uses 5 cubic meters for a two-room house. These industries can have an impact on the availability of fuel and raw materials for households.

Wood collection alone requires considerable time (Table 1). Yet the return per unit of human time and labor invested in fuelwood gathering is very low. For example, a round trek of seven to ten kilometers, requiring about four to six hours of a woman's time, may yield only enough firewood for one day's cooking and heating needs in a household of four to five persons. This traps the landless poor, especially poor women, in a subsistence level of living with low productivity. Meeting basic needs for fuel alone consumes much time and labor that can not be diverted to more productive or life-enhancing activities.

The direct and indirect unit cost of the energy needed to fulfill basic needs is much higher for the poor than the relatively affluent. Not only is the cost of economic opportunities lost much higher, but the actual cost of energy used for a specific activity (e.g., cooking) is also much greater. In addition, there is the ecological price of the poor's forced dependence on inefficient biomass-based technologies (e.g., open cookstoves) in the absence of alternative energy sources.

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PART III. Appendices

Appendix 1. DIRECTORY OF ATTENDEES

NATIONAL TRAINING WORKSHOP ON INTEGRATING WOODFUEL PRODUCTION AND MARKETING IN FOREST, AGRICULTURE AND TREE PRODUCTION SYSTEM

29- 31 July 1997
Teachers' Camp, Baguio City

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Appendix 2. TRAINING COURSE AGENDA

NATIONAL TRAINING WORKSHOP ON INTEGRATING WOODFUEL PRODUCTION AND MARKETING IN FOREST, AGRICULTURE AND TREE PRODUCTION SYSTEMS
Teachers'Camp, Baguio City
July 29 – 31, 1997

AGENDA

TIME	TOPIC	RESOURCE PERSON
Day 1		
0700 – 0830	Breakfast	
0830 – 0900	Registration of Participants	
0900 – 0930	Opening Ceremony	
	Invocation	Ms. Ched Ulibas
	National Anthem	Ms. Ched Ulibas
	Welcome Address	RED Oscar M. Hamada
	Message	Mr. Tara N. Bhattarai
	Address	Dir. Jose D. Malvas, Jr.
0930 – 0945	Coffee Break	
0945 – 1000	Introduction of Participants	
1000 – 1015	Overview of the Training Workshop	Ms. Mayumi Ma. Quintos (FMB)
1015 – 1100	National Training Course on Integrating Woodfuel Production and Marketing in Forest, Agriculture and Tree Production Systems	Mr. Tara N. Bhattarai (FAO-RWEDP)
1100 – 1200	National Woodfuel Situation	Asst. Director Bayani S. Nera
1200 – 1300	Lunch Break	
1300 – 1400	Household Wood Energy Consumption Study for 1995	Ms. Felicisima V. Arriola (DOE-NCED)

NATIONAL TRAINING WORKSHOP ON INTEGRATING WOODFUEL PRODUCTION AND MARKETING IN FOREST, AGRICULTURE AND TREE PRODUCTION SYSTEMS
Teachers'Camp, Baguio City
July 29 – 31, 1997

AGENDA

TIME	TOPIC	RESOURCE PERSON
1400 – 1500	Socio-Economic and Environmental Impacts of Woodfuel Production	Ms. Ruby Buen (DENR-PPSO)
1500 – 1515	Tea Break	
1515 – 1615	Study on Woodfuel Flows in Six Urban Areas of the Philippines	Ms. Felicisima V. Arriola (DOE-NCED)
1615 – 1715	Case Study (Fuelwood Management Study of Sagada and Besao, Mountain Province)	Mr. Paquito Untalan (BSU-ANEC)
1800	Dinner	
Day 2		
0700 – 0800	Breakfast	
0800 – 1700	Field Trip (Brgy, Bigbiga, Sudipen, La Union)	
1800	Dinner	
1930	Social Activity	
Day 3		
0700 – 0830	Breakfast	
0830 – 0930	Woodfuel-based Industrial Commercial Activities and their Contributions in Rural Socio-Economy	Mrs. Merlita M. Pacis (DMMSU)

NATIONAL TRAINING WORKSHOP ON INTEGRATING WOODFUEL PRODUCTION AND MARKETING IN FOREST, AGRICULTURE AND TREE PRODUCTION SYSTEMS
Teachers'Camp, Baguio City
July 29 – 31, 1997

AGENDA

TIME	TOPIC	RESOURCE PERSON
0930 – 1015	Gender Specific Roles in Wood Energy Systems	Ms. Juliet Texon (DENR-PPSO)
1015 – 1030	Coffee Break	
1030 – 1200	Group Discussion/Workshop	
1200 – 1300	Lunch Break	
1300 – 1445	Continuation of Workshop	
1445 – 1500	Coffee Break	
1500 – 1600	Presentation of Workshop Output	
1600 – 1700	Closing Ceremony	
1700	Free Time	

Appendix 3. CONSULTANT'S PAPER

NATIONAL TRAINING COURSE ON INTEGRATION OF WOODFUEL PRODUCTION AND MARKETING IN FOREST, AGRICULTURE AND TREE PRODUCTION SYSTEMS

by

Tara N. Bhattarai

Country Background

The total forest covered area in the Philippines was approximately 8 million ha (or 27 percent) in 1990. Of this amount, natural forest comprised about 7.8 million ha and forest plantations not more than 0.3 million ha. However, an additional 5.6 million ha (or 19%) of land was classified as "other wooded land" which might play an important role in the supply of woodfuels consumed in rural areas.

Statistics indicate that some 36 percent of the total estimated population of about 67.6 million in 1995 (average growth rate 2.1% during 1990-95) lived in the rural areas. A notable change in the demographic characteristics that was observed during the same period was the high rate of growth in urban population (4.2%) as against a negative (-0.1%) growth in rural areas. The energy consumption pattern in the country shows a majority of the rural households relying heavily on traditional sources of energy, particularly fuelwood and charcoal. The share of traditional fuel in total energy consumption in 1993 was estimated as approximately 33 percent (or 382 peta joules). Besides the household sector, a number of traditional industries and commercial activities also use biomass fuels for energy. Despite a continuing growth in commercial fuel consumption over the years due to a growing economy and industrialization, the use of traditional fuels has not declined in absolute terms. Woodfuel and other biomass fuels of different kinds are still important sources of energy in many traditional industrial/commercial activities, also in the non-residential sector. It is believed that the non-residential sector alone consumed slightly over one-third of the total traditional fuels supplied in 1990. Although any reliable data on the share of woodfuel in total traditional fuel consumption is difficult to obtain from existing secondary sources, the Philippines Energy Plan 1996-2025 presents its estimated share in 1996 total energy consumption as about 21 percent.

Available information regarding the national level traditional fuel consumption/ supply is, so far, only a best estimate. One can always find a significant variation in the data between different sources. For example, the Master Plan for Forestry Development (MPFD), 1990 reports a woodfuel supply shortage of 15.5 million m^3, on the other hand, the Philippines Household Energy Strategy (PHES) survey presented a three-fold greater sustainable woodfuel supply potential in 1990 in comparison to the existing demand of woodfuel. The important findings of the PHES study is the contribution made by non-forest areas (i.e. scattered trees in homesteads/homegardens or farm lands; private- or farm- forests; village- or community- woodlots; etc.) in the supply of woodfuel. It is reported that this source alone contributes more than 60 percent the woodfuel supplied in the country. It is also reported that approximately 10% of the rural Filipino households (about 600,000 people) derive up to 40% of their cash income from commercial trade of woodfuels in the market.

On the supply side, despite the imposition of strict protective measures, deforestation has not stopped completely. The crucial issues are the ever increasing demand for new land for agricultural expansion to support the growing population, and the practice of slash and burn in upland areas in the absence of reliable alternative employment opportunities for the poor and marginal farmers - common issues in virtually all RWEDP member countries. Further, the government has also enforced a long-term logging moratorium to protect the remaining natural forests. To meet people's needs community participation in sustainable forestry development has been encouraged under different schemes. The expanding areas of forest plantations and tree farms, and the other non-forest production sources together, can perhaps enhance the woodfuel supply in forest deficit areas in the future.

Another clearly visible trend, which also applies to virtually all RWEDP member countries, is the energy transformation that is taking place currently, mostly in favor of commercial fuels. It is considered to be associated with the growth in the national economy as well as the rate of urbanization. Together with this energy transformation, the future demand for commercial fuels in the Philippines is expected to grow year after year, and it is being reflected directly in the annual energy balance. But, this growth in commercial energy consumption has not reduced, and is not expected to reduce, the demand for traditional fuels within the foreseeable future, at least in absolute terms. Available information suggests that the share of traditional fuels declined from 37 to 34 percent between 1980 and 1991, but at the same time, in absolute terms consumption has also increased from 311 to 382 peta joules.

Besides the traditional agroforestry practice of integrating trees into the farming system which has been in existence for a long time, new non-forest area based agroforestry systems have slowly emerged in recent years wherever woodfuel markets exist, initiated by private sector investors. The contribution made by social or community forestry development programmes in the region, in enhancing the supply of wood and woodfuel in different RWEDP member countries including the Philippines, has already received global recognition.

In order to maximize the benefits from such positive undertakings and new development opportunities, all critical issues should be thoroughly analyzed and critical constraints must be identified and addressed while making necessary reforms in existing policies and programmes that may be acting as hindrances. Only then may it be possible to overcome the problems faced by the farmers in their efforts at integrated land management, including the sustainable production, unhindered flow and optimal utilization of wood fuel.

Regional Background

Some important facts which convey a picture of the wood energy situation in RWEDP member countries in Asia include the following:

1. RWEDP member countries consume about 10,000 PJ of woodfuel each year, which is about 30% of total energy consumption. Large variations exist between data provided by different sources: FAO, WRI, UN, IEA, AEEMTRC, HESS.

2. Despite most country level energy balances showing a declining share of biomass in total energy consumption in recent years, woodfuel consumption in Asia is increasing at an annual rate of 1.6 % in absolute terms and is not expected to decrease within the foreseeable future.

3. The economic value of woodfuel consumed in RWEDP member countries (except Cambodia) amounts to about US$ 30 billion, using an average woodfuel price of $ 40 per ton.

4. Country specific information related to the socio-economic impacts of wood energy is not yet fully known, but studies conducted in a number of RWEDP member countries show it makes a significant contribution to the country's socio-economic life. It is believed that the woodfuel business in Asia is the main source of income for 10% of the rural population.

5. Traditional woodfuels may comprise woody biomass of different kinds (i.e. stem-and branch-wood, twigs, sawdust, logging and processing residues, charcoal, etc.); modern wood energy may include the heat and power generated from woodfuel combustion.

6. Woodfuel supply sources may include both forest and non-forest lands, i.e., managed/protected natural forest, degraded forest or scrub land, forest and non-forest tree plantations, homestead/homegarden trees, private/village woodlots, farm-, community forests, etc.

7. Logging and milling residues contribute significantly to woodfuel production; only about 20% of the trees harvested may be available as kiln dried sawn wood after passing the multiple stages of wood processing.

8. The exact ratio of forest and non-forest area supplied woodfuel is not known; it differs significantly from area to area even within a single country depending upon various factors; data from 7 member countries of RWEDP show the share of forest and non-forest area based production as 1/3 and 2/3, respectively.

9. Most traded wood fuels originate within 100 km distance from markets, but the self-collected portion come from within a 20 km radius. Recycled wood (from old construction sites, packing cases), driftwood, etc. may contribute as much as 20% to the total supply.

10. The traditional perception that deforestation is caused by the heavy reliance of people on woodfuels for energy in Asia is now found incorrect in most cases. In fact, forest clearing for agricultural land expansion is and always has been the most crucial cause of deforestation, globally.

11. The projected woodfuel supply/demand imbalance for most countries in the region, which was based on the "gap theory" in the mid 1970's, now seems completely outdated. It ignores the potentials of non-forest supply sources as well as interfuel transformation within biomass sources.

12. The share of woodfuel in total round wood production in the region is very high (between 70% to 97%); only one country, Malaysia, has a lower share (about 17%).

13. Energy transformation in favor of commercial and/or inferior biomass substitutes is taking place in both urban and rural areas, depending on accessibility, availability and affordability.

14. Sustainable production and use of woodfuel can be socially, economically and environmentally feasible, provided unnecessary impediments are removed to promote the expanded participation of the private sector.

15. Most governments and energy sector planners in developing countries seem still unaware or ignorant of the role of wood energy in the national economy - wood energy is not yet a priority sector for development.

RWEDP Objectives

Long term development objective:

The long-term objective of RWEDP is "to contribute to the sustainable production of wood fuels, their efficient processing and marketing, and their rational use for the benefit of households, industries and other enterprises".

Immediate objectives:

The immediate objectives of RWEDP during its current third phase (1994-1999) are to:

1. contribute to an improved database on wood energy at regional and national level (with the latter target area considered to be more important) and to improve the capacity of institutions to generate, manage and assess such data at regional, national and sub-national level;

2. contribute to the development and adoption of improved wood energy policies, plans and strategies in member countries; and

3. improve the capabilities of government, private and community-based organizations to implement wood energy strategies and programmes.

Therefore, the present national training course on "Integration of Woodfuel Production and Marketing in Forest, Agriculture and Tree Production Systems in the Philippines" is one of many activities that are planned to achieve the immediate objective 3 of RWEDP.

National Course Objectives

The specific objectives of the national training course are to:

1. network participants from GOs, NGOs and POs that contribute, or are likely to contribute to the production, distribution and marketing of woodfuel in different parts of the country;

2. enhance knowledge and understanding of participants about the role of woodfuel in the national economy/rural socio-economy, including income and employment generation, methods of production and marketing from both forest and non-forest sources (i.e., government/community forests or private forests and farm lands), and identify strategies which could enhance production and promote the unhindered flow and utilization of woodfuel produced in non-forest lands;

3. contribute to developing country capacity to formulate and implement integrated wood energy development programmes that lead to the adoption of sustainable land use practices; and

4. contribute to enhancing institutional capabilities to plan and implement training courses that promote the integration of trees and other woody perennials into the farming system.

Expected Output

Considering the important role of traditional fuels in the national economy (including the rural socio-economy) and the current priority of the government in the development of renewable indigenous sources of energy, RWEDP has been assisting the Philippines in her wood energy development efforts by sponsoring numerous programmes, including the present national training course.

During the next three days of deliberations and field observations, participants are expected to make a critical review of the woodfuel supply/demand situation; identify the crucial issues and constraints that may be currently hindering the development of the sub-sector, particularly woodfuel production and marketing; and recommend some pragmatic strategies to promote integrated systems of woodfuel production and marketing into the extension programmes of the forestry, agriculture and other related sectors. Therefore, participants are encouraged to identify the constraints and problems related to production and marketing of woodfuels, raised particularly by the private sector and community organizations in non-forest lands.

In the group session, participants are expected to review all important on-going extension programmes in forestry, agriculture and related sectors that are under implementation at different levels (e.g., province, region, district, etc.), which are directly relevant from the point of view of enhancing woodfuel production and marketing, as well as for environmental preservation.

To make participants aware of the importance of wood energy in the national economy, and to raise their understanding about the role/contribution of wood fuel to rural employment and income generation, the class room sessions will cover a number of case study presentations by experienced resource persons, exclusively dealing with the issues of woodfuel production, flow and utilization in the country, together with analyses of prevailing policies and strategies of the relevant sectors (forestry and power) in relation to future development in the sub-sector. The planned field visit will allow participants opportunity to observe the prevailing practice of wood fuel production, marketing and utilization in local areas. It will also give them the opportunity to directly interact with producers, traders and commercial/industrial users of the wood fuel.

The knowledge acquired from the field observations and classroom sessions will later be synthesized in group discussion sessions. At the end of these discussion sessions participants will recommend how existing policies and regulations in different sectors should be amended in order to promote the sustainable production, unhindered flow and open trade in wood fuel and related products in the country, through competitive marketing channels. Recommendations will also include a list of area specific draft training proposals which will serve as local level follow-up actions to the present national training course.

For enhancing participants' understanding of factors that may affect household level farm management decisions, which could also influence the decision regarding the integration of woodfuel production and marketing into the farming systems, a "Framework for Understanding Household-Level Decision Making", developed by FAO-APAN is to be provided to participants. These factors may independently or collectively influence farm household level decisions regarding both investment and marketing as well as production and conservation.

Framework for Understanding Farm Household-Level Decision Making

(This is a tool used by APAN to explain the complexity of farm management systems in order to promote pragmatic agroforestry extension strategies in its member countries.)

A. The farm household is used as the primary unit for analysis

1. Each household has a unique set of socioeconomic and biophysical conditions

2. Production technology and investment decisions are evaluated by farmers and entrepreneurs based on:
(a) access to markets
(b) access to support services
(c) access to scientific and indigenous knowledge
(d) policies, rules and regulations

B. Farm households make resource allocation decisions

C. Farm households divide roles and responsibilities among different family members (i.e., male, female; productive youth, elderly, etc.)

D. Household-Level Farm Management Decisions (Part I)

These relate to:

1. Investment and marketing identification of a need/market opportunity may lead to selection of the crops to be planted and the land to be used or investment (labor, money, materials) required; who will be responsible for establishment and maintenance; how the products will be marketed; the choice of agricultural enterprises; allocation of labor, land and capital; acquisition of inputs; marketing.

2. Production and conservation - farmers have to make choices regarding management of the production process - the best farmers will select sustainable practices, perennial/annual, livestock/fish; conservation practices; off-farm employment; etc.

E. Decisions are influenced by On-Farm Factors (Part II)

1. Socio-economic conditions (Assets, level of control over land; household composition and allocation of responsibilities; risk tolerance; debts; off-farm employment and income, etc.).

2. Biophysical Conditions (Soil; moisture; slope; altitude; aspect; biological factors including pests and diseases, etc. most important but beyond the control of the farm family).

F. Decisions are influenced by Off-Farm Factors (Part III)

1. Markets and market channels (local, provincial, international; middlemen, producers associations; brokers and traders, large-scale industries; commodities exchanges, international cooperation, etc.)

2. Policies, rules and regulations (traditional laws, common practices; written legislation, national, international, etc.)

3. Support services (roads, credit institutions, suppliers, subsidies, etc.)

4. Technical information (different aspects of growing crops, i.e. propagation

5. Harvesting; information flow channels: from other farmers, from research and extension workers, from industry and brokers, etc.

(People do not use a linear decision making process; farmers consider many factors simultaneously)

Alternative Extension Approaches

Four different extension approaches have been identified each which may be applicable to certain conditions and may be appropriate at certain points in time. It would be a mistake to try to force any one extension system upon diverse sets of conditions.

Range of Extension Approaches

Authoritarian System	Participatory Extension System	Farmer-to-Farmer Exchange	Commercial and Market Driven

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Appendix 4. PHOTO DOCUMENTATION

OPENING PROGRAM

FIELD TRIP

CLOSING PROGRAM