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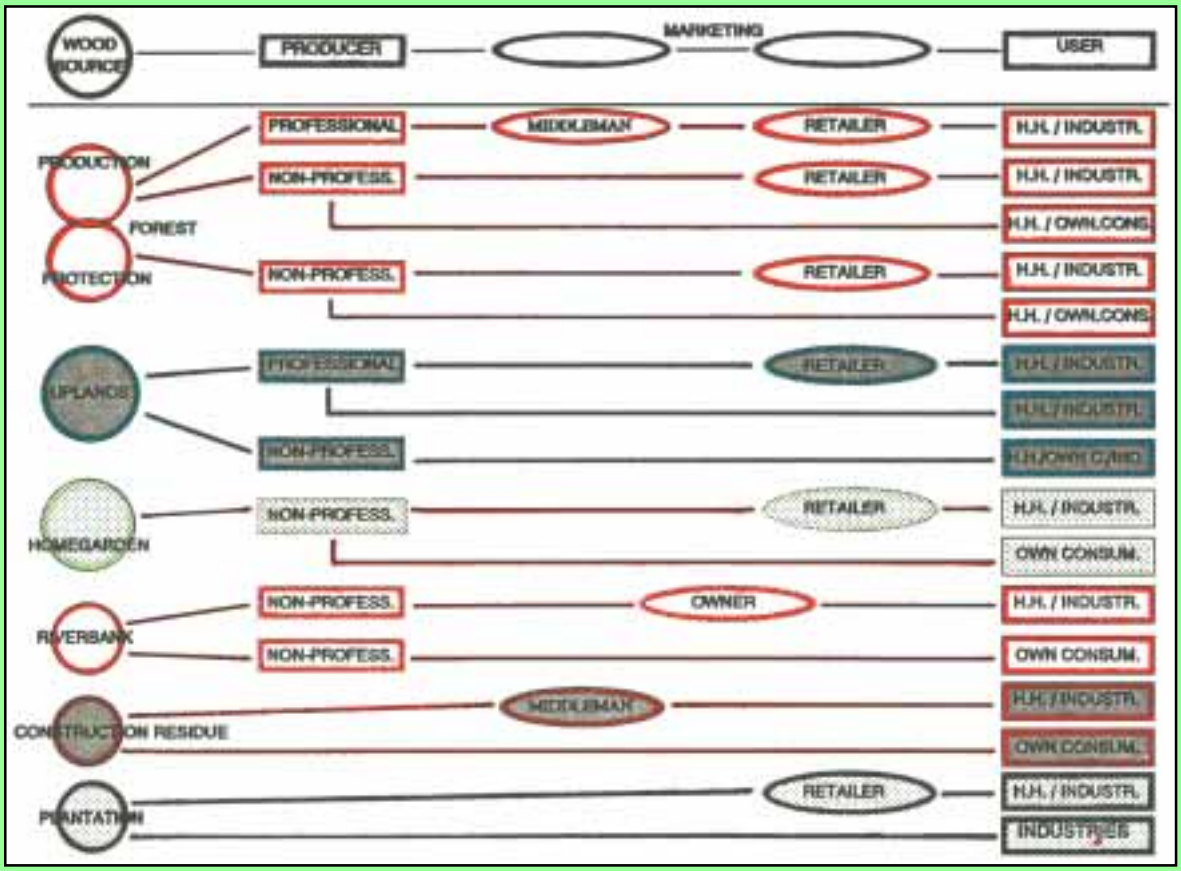
REGIONAL WOOD ENERGY DEVELOPMENT PROGRAMME IN ASIA
GCP/RAS/154/NET

WOOD ENERGY DEVELOPMENT:

PLANNING, POLICIES AND STRATEGIES

VOLUME III
Papers presented at the "Seminar on Policy Instruments for Implementation of Wood Energy Development Programmes"



FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
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These proceedings consist of three volumes:

Volume I: Report on the RWEDP Regional Meetings on Wood Energy Planning and Policies
Volume II: Papers Presented at the "Expert Consultation on Data Assessment and Analysis for Wood Energy Planning
Volume III: Papers Presented at the "Seminar on Policy Instruments for Implementation of Wood Energy Development Programmes"

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FOREWORD

Development of appropriate wood energy strategies and improvement of the capabilities of member countries in planning wood energy development programmes are two important objectives of the Regional Wood Energy Development Programme in Asia (RV;EDP). Since its inception in 1985 RWEDP has supported a large number of case studies, workshops and training courses on various specific subjects related to these two objectives. The list of RWEDP publications on the back of this document reflect the project's past activities in this field. Other national and international institutions and organizations have also contributed to an improved information base on wood energy.

The actors in wood energy systems, from the supply and demand sides, are clearly identified and their roles are now better defined than in the past. In addition forest resources are beginning to be assessed and evaluated in a more systematic way.

For example, while earlier the use of fuelwood by poor people was seen as the cause of deforestation it is now recognized that other factors such as conversion to farmlands, industrial use of forests and forest fires - for which not always the poor people are responsible - are also important causes.

It has also become clear that wood energy provides opportunities for income generation and rural development and deserve attention of policy makers from a broad range of sectors.

While considerable progress has been achieved in improving national capabilities in research, training, education and wood fuel surveying additional efforts are required to create multidisciplinary teams capable of mastering the subject and involving relevant groups (local governments, villagers, NGOs, university research and extension programmes, and others) in the planning and implementation of wood energy projects.

Unfortunately, the quality of wood energy data available is still inadequate for conducting detailed sectoral reviews and wood energy planning activities. In many countries, this lack of accurate information leads to controversial interpretation of the energy situation and hampers the correct identification of solutions to be undertaken.

The end of the second phase of RWEDP was considered to be an opportune time to reflect on the progress made in our understanding of wood energy issues in RWEDP's 11 member countries and on possible issues to be addressed in a follow-up project.

Thus, from 22 February to 3 March 1993, two consecutive regional meetings were conducted in Chiang Mai, Thailand. The first one, aimed at planners from RWEDP member countries, was an *"expert consultation on data analysis and assessmentfor wood energyplanning"while* the second one, aimed at policy makers, was a *'seminar on policy instruments for the implementation of wood energy development programmes".* 36 participants came from the member countries to the two meetings, and a total of 29 papers by 23 resource persons were presented.

A wealth of information became available during these meetings and RWEDP is grateful to all the participants and resource persons who contributed to lively discussions and/or acted as rapporteurs of the various sessions and workshops. Particular thanks go to C. Heruela, who as a consultant to the project was primarily responsible, from the initial conceptual framework to the final editing of the three volumes of this report. I also wish to thank Aroon Chonicharn and Cor Veer for their valuable inputs in preparing the agenda's and Tina Sriratana, Pimpa Molkul, Panpicha Issawasopon and Navaporn Liangcheevasoontorn for their assistance in the organization of the meeting and Panpicha for the typing and design of the documents.

It is hoped that the two meetings and this report will generate appropriate attention to wood energy from planners and policy makers in the field of energy, natural resources and rural development. Hundreds of millions of poor people in our member countries, depending on this important source of energy and income, deserve it.

Egbert Pelinck
Chief Technical Adviser

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SPEECH DELIVERED

by

Mr. Pongpayome Vasaputi
Vice Governor of Chiang Mai Province

Mr. Vehmeyer,	Representative of the Government of The Netherlands
Mr. Suchinda,	Assistant Secretary General, NESDB
Mr. Trossero,	Representative of the Assistant Director General Forestry Department, FAO
Mr. Pelinck,	Chief Technical Adviser of The FAO Regional Wood Energy Development Programme in Asia

It is a pleasure and an honour to welcome you to the beautiful city of Chiang mai. Every day thousands of tourists visit our province but it is a very special day for us when senior officials and experts from 11 countries in Asia are coming together in our city to deliberate an important aspect of the household's economy of more than half the population of Asia.

Fuelwood for many years has been the only source of energy for cooking and processing food and other products like bricks, tobacco.

And even in a country like Thailand, with a high economic growth fuelwood and charcoal is still around I understand that during your field visit yesterday you saw both traditional and modern use of wood for fuel. I am glad that you had that opportunity.

I hope very much that this trip has given you inspiration for the discussions you will have over the next 3 days.

As a Vice Governor of this Province, I am particularly interested in the role provincial governments and administrations can play in developing policies that can promote better and sustainable use of wood for energy without negative effects on the environment.

Chiang Mai can provide you with much more than hotels and meeting room and I would recommend that you take some time off to enjoy the culture and shops of our city.

I am looking forward to the outcome of your meeting.

OPENING ADDRESS

Policy Instruments for Implementation of Wood Energy Development Programmes

by

Mr. Pairoj Suchinda
Assistant Secretary-General, National Economic and
Social Development Board
1-3 March 1993
Chiang Mai Orchid Hotel, Chiang Mai

Distinguished Participants, Ladies and Gentlemen,

It is my great honour to have an opportunity to attend such an interesting seminar. First of all, I wish to express my thanks to FAO who serves as the seminar organizer and also has taken great responsibility for the Regional Wood Energy Development Programme. And special thanks is to be expressed to the Government of the Netherlands who has kindly donated a considerable amount of fund for the launching of the Programme, which has made this seminar possible.

In the sense of general public, the theme of "wood energy" may seem to have a small scope. But, as a matter of fact, it really has great implications on the economy as a whole, as well as several other development sectors. In my viewpoints, there are three main sectors which would be interrelated with the wood energy policy. Those are the forestry sector, the energy sector and the environment sector.

Since the seminar to be conducted today is concerned with the policy context, I therefore would like to present you with the matter of policy direction of those three development sectors which I have just mentioned. And for the sake of convenience, I am going to use the case of Thailand.

The first sector is the forestry sector. Under the Seventh National Plan, the national planners put concentration on conservation forests and set the target to have conservation forests of 25 percent of the country area. We take more concern on this matter because, throughout the past period, forest resource has been depleted and utilized for various economic activities. Pressure on natural forests has therefore increased over time. Nowadays, although we have already developed a clear policy and target for forest resource, what we still need is how to make the policy and target materialize. And how can we make sure that deforestation can be absolutely halted? These questions are not easy to answer. And to tackle the problem is not a simple job. This is what the national planners have always realized. Why is that? As generally known, the complication of the problem is characterized by the fact that the forestry issue does not only involve "forest" itself; it also involves "people" residing within the forest areas. National planners are well aware that practical solution will have to resort to a package of development programmes and projects which would try to mobilize coordinations among all agencies concerned, as well as among the people themselves. Among other things, I consider that the Wood Energy Programme that we are now trying to develop would be helpful because it would serve as one of those programmes for achieving the forestry policy.

Then, we come to the second sector which, I think, has direct relation with FAO's Wood Energy Programme, that is, the energy sector. As a result of rapid economic expansion, the total amount of energy consumption in Thailand has risen remarkably. In particular, during the past decade (1981-1990), the total amount of energy consumption incased from 15.6 million tons of oil equivalent to 28.9 million tons of oil equivalent which is the increase at an average rate of 5.3 percent per year. Since the domestic supply of energy is far from sufficiency to meet the increasing demand, this necessitates the energy import to increase to the value of 85,033 million Baht in 1990, which is an equivalent of 10 percent of the total import. The import of energy constitutes a proportion of 45 percent of the total energy supply existing in the country. And it appears that nearly all of the energy imported are in the form of crude oils and petroleum products.

The data I have just presented indicate that Thailand has the need to plan for the domestic energy development, including both modern energy and renewable energy so that we can satisfy the rising demand and can accommodate economic growth for the upcoming period.

In this connection, I consider the role of renewable energy in which wood energy takes the main part, very, very important. There are two reasons for this support. Firstly, the use of wood energy can certainly help reduce the country's dependence upon energy import which has recently increased in massive volume.

This is not preferable because too much dependence leads to the worsening of the balance of payment. Secondly, wood energy still plays a dominant role in the rural sector; rural households and rural manufacturing still have to rely on the cheaper source of energy, that is, fuelwood. At present, there are approximately 60 percent of the rural medium-scale industries which are using fuelwood.

Now we come to the third sector which is very relevant to the wood energy policy, that is, the environment sector. Most of us might have currently got used to the term of "win-win policy" which means the economic policy that brings economic benefits without destroying the environment. On the contrary, it may be even positive to the environment. In the past and even now, people observe that the activities of economic development are usually followed by adverse impacts on our environment. This brings about the misleading that economic development is the fundamental cause of environmental problems. It is not until the concept of "win-win policy" has been largely discussed that people began to understand that economic development is not necessarily associated with the environment problems. So now I think that the Wood Energy Programme can be classified as an example of the "win-win" activities which would help in pushing economic development out of such a blame.

In summary, the development sectors which are considered most relevant to the wood energy policy include the forestry sector, the energy sector and the environment sector.

I think it is a good time to have the discussion on the policy issues as this will benefit all of us who are from various organizations and all member countries.

Thank you very much.

Speech for Seminar Policy Instruments for Implementation of Wood Energy Development Programmes

by

Mr. Paul A.M. Vehmeyer, Deputy Permanent Representative of the Netherlands to ESCAP

Openingsession March 1

Ladies and Gentlemen,

On behalf of the Netherlands Government and the Dutch Development Cooperation in particular, I am pleased to address this eminent meeting of experts and senior officials from 11 Asian countries. Let me first refer to the global perspective of this gathering and dwell later on the knitty-gritty of implementation of laudable policies and well thought out programmes.

Since very short time we have a SDC, a Commission on Sustainable Development. This Global Commission of 53 members is charged with the implementation of the Outcome of UNCED, The UN Conference on Environment and Development held at Rio in June 1992.

For the purpose of this gathering I would like to recall the UN Resolution on the Institution Arrangements of UNCED.

It is stated that the earlier mentioned Commission shall:

'@promote the incorporation of the Non-legally BindingAuthoritive Statement of Princolesfor a Global Consensus on the Management, Conservation and Sustainable Development ofAll T)pes of Forests in the Implementation of Agenda 21, in particular in the context o the Review of the implementation of Chapter 11", **combating deforestation.**

All what I am trying to say for the purpose of our meeting today is, we better start something as "Big Brother is watching us now". Yes, we thought in the Netherlands that 53 members was rather big. But the Commission is "on" since the beginning of last month and that is by far the most important. In fact the Commission concluded just last Friday its very first Session, which was an organizational one, and at which it had to decide about thernatical clusters. It also had to make up its mind about the way progress was to be monitored and reviewed. Land, Forest and Biodiversity was proposed to be cluster number 7. We still have to find out whether already specific international and regional monitoring of "our" cluster was vetted and whether we for real progress in the coming years indeed can refer to our lucky number under Agenda 21.

It might be interesting to recall the estimate about the cost of implementation of Chapter 11. The rough calculation amounted to $ 31.25 billion, including $ 5.67 billion in economical and technical assistance. Now, the timeframe for the implementation is not mentioned in relation to the cost estimate, but the amount is part of the new and additional annual investment and expenditure of $ 600 billion that the full Agenda 21 is requiring.

Until now the Netherlands' contribution for this Regional Wood Energy Development Programme has been US$ 8.7 million. For the next phase - its third - the FAO is according to the

Ministry concerned submitting a proposal for an amount of, US$ 8.8 million. This to be spent over a five-year period.

Although there are a range of forestry conservation programmes as well as initiatives which contain a wood energy component, not a single agency but the FAO has a full scale Wood Energy Development Programme. This is hard to grasp as 80% of all energy used by rural population is still obtained from burning wood.

Having pulled out these Agenda 21 cost estimates a moment ago, you can quickly infer that the FAO-effort is in the order of a thousandth of what, according to a consensus in RIO, is regarded to be needed. As this bill on RV*IEDP until now is only footed by the Dutch we advocate that other donors share in these ever increasing efforts.

The origins of the RWEDP go back to 1993 when ESCAP and FAO defined on behalf of 10 countries in the region the need to improve the way the regional wood energy issue was addressed. In 1985 the programme was launched and over 1,000 experts in 11 countries have since then participated in various meetings and training programmes related to wood energy.

As we started with the RWEDP in 1985 and renewed our commitments for a second phase in 1989, what have our experiences been so far? What did we learn in the process and what do we think of continuing it?

As a preamble I may recall at a glance three key issues in the Dutch Development Cooperation Programme.

First, development should be oriented towards self-reliance for the poor of which in this part of the world are well'over 50% still to be found in rural areas. So alleviation of structural poverty is the overriding aim of all interventions.

Second, development should enhance the autonomy of women which will particularly mean in the context of the rural energy issue to help vest their solid influence on the decision-making process in the rural communities.

Thirdly, no development should be stimulated unless it is environmentally safe and sound which since the Brundtland report is commonly referred to as promoting and assuring economic growth and social progress that is environmentally sustainable.

On our experience:

- a blend of promising results as well as outputs which need to be upgraded:
- the social forestry issue has been approached with great creativity and the concept has been expediently disseminated; the training of over 1,000 policy makers was already mentioned and may provide you with an idea of the scale of that exercise; one may think of the multiplier that such training has set off;
- the woodenergy-issue as the mainstay of small scale rural energy provision has come to the fore; there is now wide spread appreciation of the role of wood energy policy in sustainable land use, and more fundamentally its value and importance for the overall national energy policy;

- also a break-through was achieved by creating acceptance for the value of firewood in small scale rural industries; a general awareness was achieved about the multiplier-effects that practicing such woodenergy generate in off-farm employment;
- the development of wood stoves and charcoal production technology is considered to be useful;
- the impact of activities aimed at increasing wood production or piloting agro forestry was unimpressive; the outcome of the appraisal of this component of the programme was to leave this to the national level either by the government agencies, by ngo's or ideally by interplay of both actors;
- focus and coherence of activities in the overall-programme should be enhanced; particularly underdeveloped was investment in data collection;
- whether the lack of inter-action with other programmes on environment, land use, commercial forestry and other forms of energy was caused by the ambition of the RWEDP itself, by the lack of reliable data or by arbitrary selection of priorities is difficult to say, but better planning and holistic approach in policy development is certainly called for.
- instituting project activities in National Committees of the participating countries is not viewed as very productive in the long run.

The cost effectiveness of the programme was considered quite high. Looking to the large geographical coverage (11 countries and average annual cash-outlays of US$ 70,000.- pro country) the results were regarded good value for money and as such RVVEDP is successfully competing with alternative programme sin the energy sector.

All in all it seems highly desirable to continue and call for joint efforts by the participating countries to have other nations in the region joining the bandwagon.

All in all it seems highly desirable to continue and call for joint efforts by the participating countries to have other nations in the region joining the bandwagon.

In the meantime the following wishes have been tabled in Rome:
(the list is of course much longer)

- yes, keep wood energy the central focus of the programme but give more attention to the marketing situation and the possibilities of substitution of other forms of biomass;
- enhance the added value of the regional programme next to the national activities by concentrating particularly on the development of methodology for the inclusion of wood energy in the national energy policies and programmes;
- develop technology and facilitate transfer of knowledge in the area of wood conversion for the industrial sector; this to improve on resources efficiency,
- expresses verbis we have pointed to the need to become more complementary to other regional activities in forestry and related sectors.

Finally, which may also conclude this early address in your meeting, the need for a strengthened institutional base seems there. At least if that base is to service the much wider area. Conditional would be the development of impact assessment tools and of course the practicing of those. Depending on that we would - did I say W 0 0 D ? - be willing to participate in the next phase and beyond.

I wish you and FAO/RWEDP staff a very fruitful seminar. Thank you.

Seminar on Policy Instruments for
Implementation of Wood Energy Development Programmes
Chiang Mai Orchid Hotel, Chiang Mai, Thailand
1-3 March, 1993

STATEMENT

BY

MR. MIGUEL TROSSERO *
on behalf of Assistant Director General,
Forestry Department, FAO/Rome

Honourable Mr. Pongpayome Vasaputi, Vice Governor of Chiang Mai,

Mr. Pairoj Suchinda, Assistant Secretary General, NESDB, Royal Thai Government,

Mr. Paul Vehmeyer, Deputy Permanent Representative of the Netherlands to ESCAP, Netherlands Embassy in Thailand.

Mr. E. Pelinck, Chief Technical Adviser, Regional Wood Energy Development Programme in Asia,

Distinguished experts and guests, ladies and gentlemen.

It is indeed my great pleasure and privilege to have this opportunity to be with you to inaugurate this Seminar on Policy Instruments for implementation of wood Energy Development Programmes.

On behalf of the ADG, Forestry Department, I wish to express my gratitude to the Royal Thai Government for its hospitality, to the Government of the Netherlands for this continuous financial support and, particularly, to the project staff for all the dedication provided for the preparation of this meeting.

I wish also to give a warm welcome to all the international experts, Heads and Senior staff of energy and forestry planning, our guests resource persons and observers taking part in this consultation.

As senior staff of the forestry and energy agencies you have realized of the big changes that have occurred over the last decade of activities in the wood energy sub-sector and to which our RWEDP has largely contributed since its inception in 1985.

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* Acting Chief, Non-Wood Products and Energy Branch (FOPN), FAO/Rorne

In the '80, the main wood energy problems to be tackled were dominated by fuelwood and charcoal shortages and the pressure on scarce forest resources. The main solutions adopted by forestry institutions were characterized by actions leading to tree plantations in order to reduce the deficit between the demand and supply, dissemination of improved cooking stoves and more recently the promotion of kerosene and gas stoves for the substitution of fuelwood and charcoal at household level.

Whereas, in the energy sector actions were focused on biomass energy and more particularly wood fuels, as a relatively cheap, accessible and technologically mature source of energy; which, properly managed become a renewable source of energy locally available to substitute expensive imported fossil fuels.

These and other activities were undertaken with very little interrelation among the different responsible government agencies. However, after many studies, meeting, and considerable field work it was realized the need and convenience of more integrated and better articulated activities among the different interested parties, not only between foresters and energy specialist but also for the incorporation of staff of other sectors concerned with: agriculture, rural development, environment and so forth.

Now, we have a better understanding of the interrelations of wood energy actors with several economic sectors at different layers of the society and these experience, have to contribute to re-address our wood energy policies where are available, or to formulate them if not yet established. Policies that should be the result of sound wood energy planning exercises.

Today, wood fuels still constitute a major source of energy for the member countries associated to the RWEDP and fuelwood and charcoal constitute one of the main products originated in forest resources and wood lands and, will remain to be so for many years to come.

These facts must be properly recognized at the highest level of Governments and reflected in the forestry and energy policies of our member countries.

The main concerns of the world in the current decade are focused in fostering a more sustainable and equitable development of our society and in the promotion of environmentally friendly technologies to reduce the unbalanced C02 emission derived from the combustion of fossil fuels.

Decentralized wood energy systems, rationally planned, are called to play an important role for the satisfaction of the above mentioned development and environment objectives.

However, to achieve these objectives, we need to promote a WOOD ENERGY TRANSITION of present scattered and informal Wood Energy Systems toward a more formal and better organized ones and for their successful implementation, wood energy assessments and planing exercise should be carried out and followed by the respective wood energy policies, strategies and actions.

To achieve this tasks, it will be required the important action and commitment of policy and decision makers of our project member countries, who, with their better understanding and broader perspective of the economic, technological, social and political implications involved in the multidiciplinary aspects of Wood Energy Systems will be able to incorporate wood energy in the right context of the national and forestry policies.

These policies will lead to promote the required institutional modifications in terms of legislation, education, R&D, demonstration and financial support to ensure the smooth wood energy transition.

This Wood Energy transition is expected to create more jobs and increased incomes for the poorest of rural and urban areas and at the same time, promote a locally available source of energy at competitive prices. The adoption of these measures will be also in lines with the deregulation of our economics and will help in the promotion of more commercially oriented entrepreneurial activities.

I hope you enjoy your stay in Chiang Mai and you benefit from the fruitful discussions to be held in the different sessions of the seminar and I wish that this meeting constitutes a permanent guidance for our future work.

INTRODUCTION TO THE SEMINAR

BY
E. PELINCK

Ladies and gentlemen, fellow participants, colleagues.

Let me start by welcoming you all to this first working session of the seminar on Policy Instruments for Implementation of Wood Energy Development Programmes. The Regional Wood Energy Development Programme in Asia feels very fortunate and honoured that you have made the effort to come to Chiang Mai and share with us your thoughts and experiences in drawing up, implementing or even suffering from wood energy related policies. And when I address you it is both as individuals as well as representatives of different organizations, Governments Organizations, NGO's, Academic Institutions and International Organizations.

It is a very unique opportunity to come together and discuss an issue that daily affects more than half the population of this continent but that has received only sporadic and sub-sectorial attention. The fact that Governments of our member countries have reacted to our invitation by sending in most cases a representative of both the energy sector and the forestry sector shows that we have now reached the time where a joint responsibility for wood energy development is emerging in the countries of this region.

As such we have achieved already one major objective of this seminar, which is to provide a forum for reviewing policies related to wood energy development and experiences.

A second objective is to have a comprehensive overview of the present status of policies, strategies and plans in our member countries that relate to wood energy. The papers we have received and had a chance to glance through do confirm the expectations we had when starting the organization of this seminar. New perspectives on wood energy development are emerging from studies at both the local and national level. Last week's expert consultation on data assessment for wood energy planning has underscored with solid data the importance of woodfuels in this region. The results of that meeting will be presented to you in a few minutes time.

In addition to the emergence of new information and new policies another reason for organizing this meeting at this point in time is more directly related to the planning and implementation of Regional Wood Energy Development support activities. The present phase of RWEDP ends by the middle of this year. Follow on activities are under the consideration of the institutions in the 11 countries presently participating in RWEDP, FAO and the Netherlands' Government. The presence of representatives of the Government of The Netherlands and of FAO Headquarters is a welcome indication of the importance they attach to this programme. Review of past activities and the current status of wood energy development is expected to contribute to better identification and planning of future priorities.

But most important of all I hope that the outcome of this meeting will enable you to address the problems and opportunities of wood energy in your own organization and your own country through improved policies, strategies and plans. And through that I hope that the livelihoods of hundreds of millions of poor people in Asia, rural and urban, male and female, young and old, may improve. People whose concerns have been too often ignored or misunderstood in our quest for rapid modernization.

We thank you once again for your participation and wish you fruitful discussions and a pleasant stay here in Chiang Mai.

Summary of Presentations, Discussions and Findings Regional Expert Consultation on Data Assessment and Analysis for Wood Energy Planning For Discussion, and ... Comments, Suggestions

by

Cor Veer and Conrado Heruela[1]

1. INTRODUCTION

Energy and forestry planners, researchers studying wood fuels, and other interested and knowledgeable people met in Chiang Mai from 23 to 26 February 1993, to present and discuss:

1.1 The scope, nature and quality of the information for wood energy planning and policy formulation, the management of these data for decision-making, and the role of wood and other biomass in energy and forestry planning, in Bangladesh, Bhutan, India, Indonesia, Myanmar, Nepal, Pakistan, Philippines, Sri Lanka, Thailand and Vietnam,

1.2 The implications of inadequacies in relevant information for wood energy planning and development activities,

1.3 Examples of integrated wood energy resource-use studies at national and sub-national levels, the findings of such studies and the mix of methodologies used in these examples,

1.4 Examples of energy modelling tools and other decision support systems to manage relevant information, as well as the institutional arrangements required for rural and wood energy planning,

1.5 Emerging policy and planning issues in forestry and energy; and ways and means to improve the interaction between decision making and information collection and analysis (working groups).

The above topics were presented and discussed in plenary presentations, discussions and demonstrations and in three working groups dealing with the topic mentioned under 5. They also presented some suggestions for international support activities in data collection and management, for consideration in the wood energy policy and strategies meeting.
Following is a brief summary of the presentations and discussions.

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[1] Regional Wood Energy Development Programme in Asia, FAO/RAPA, Bangkok.

2. STATUS OF DATA, DATA MANAGEMENT AND PLANNING FOR WOOD ENERGY DEVELOPMENT IN ASIA

All participants had prepared country status papers in which the database and the planning process for wood energy development in the 11 countries participating in RWEDP were described. In addition an assessment made by *Auke Koopmans* of the official statistics related to wood energy resources, uses and interactions, was presented and discussed.

The following overview is based on both types of presentations, indicating the share of biomass wood fuels according to official statistics as well as the shares that are based on other data sources. Also, an attempt is made to qualify the information on wood energy sources, the trade and subsistence and commercial consumption. Further an attempt is made to indicate the use of planning models, the degree to which wood energy is considered in energy and forestry planning, and the institutional responsibilities. One purpose of presenting this overview is to request the participants in this meeting for comments and additional information.

Country	Biomass fuel % stat. other data	Information			Info-mgmt Modelling	Institut. Respons.	Remarks
		prim.data	consolidated	'gaps'			
BGD	54 **(+100 %)**	many surveys, studies,incl.nonfor res.	BEPP, 1984	commerc. woodfuel flows	BEPP/RADA for.:RIMS	Plan.Com. For.Dep.	*planning model complic. *prof. NGOs active in wed
BHU	95 **(-100 %)**	few	Masterplan	local assessm.	none/LEAP considered for:GIS	Rural Energy FD	# scope for modern biomass energy ? # local resource pressures
IND	25 **(+200%)**	many, different scales	varied by state	trade	many models for many levels	MNES/Rur. Dev./Pl.Com. Forestry Agric.etc.	# central/state coord. # strong res.info insitut. # socfor/JFM !
INS	47 **(-20 %)**	district/ and nat.	various (WB,FAO etc.)	W.Java to other distr.	RESGEN/ GIS	ME&M Bappedas	#interest.pilots (WJava,NTT,NTB) # expansion ?
MYA	69 **(+100%)**	few	?		none for:GIS	ME FD	#much forest #central zone #income/modern biomass
NEP	92 **(-10 %)**	lots,	Masterplan WECS	reg. variation	LEAP ???? MP: ???	WECS FD	
PAK	21 **(+200%)**	excellent dbase	in process much	? (hills?)	?? ??	En.Wing FD	#central/provincial #much in process
PHI	38 **(+50%)**	excellent dbase	fuelwood policy prop.	none?	many in process	NEDA/OEA DENR	# much information # policy/progr. ??? priorities # biomass for elctr.? #decentr.expert.
SRL	52 **(+150%)**	scanty	?? (MP 1976)	in central zone ?	?	Min.Energy FD	#rur.energy plan. in process
THA	34 **(?)**	much	MP Energy ?	commerc. resourc.	various	var.energy FD	#strong univ.
VIE	51 **(+200%)**	few ?	TFAP	localiz.	En.Inst. Min.For.	?	?

The overview demonstrates that in all countries there is a considerable amount of primary, and often consolidated information, at national level and often supplemented with additional studies that throw light on specific aspects and could be used to further elucidate specific aspects of wood energy systems. The overview also demonstrates that the management of this type of information in a framework that allows for consideration of wood as one of the energy sources, is usually not present. This is also reflected in the absence of wood in the energy planning process, the description of the situation in Bangladesh in this respect may well be representative for many of the countries: "Once the demand is projected (under specified macro-economic conditions) supply options are considered: first the part of the projected demand that can be supplied by the network fuels (natural gas, electricity), next the part that can be supplied by non-network type of commercial fuels (such as petroleum and LPG), and at the last stage the balance demand is adjusted with different types of biomass fuels, assuming that the rest of the balance will be met by biomass fuels." The country papers indicate that this state of affairs may be partly attributed to the fact that the so-called "integrated energy planning", is more of an ideal than an actual practice, and that the fossil fuel constituencies are apparently better represented in the planning process than the biomass fuels. In the words of one participant actively involved in energy planning: "energy planning is not an academic exercise, on purely rational basis, it is often as much a struggle for scarce resources, in which lobbying and similar attempts at influencing the outcome of the decision making process are very much part of the game."

Whether 'better information' would change much in this regard remains to be seen.

But that there **is** a need for better, more reliable, relevant and more comprehensive information on biomass and wood fuels was convincingly demonstrated in *Auke Koopmans* presentation (see also the figures in the second column of the table on the previous page, indicating the range in estimates of biomass fuel shares in energy consumption, taken from his paper).

Koopmans in presenting his findings of assessment of the statistics quoted in the table above, indicated some of the problems in the quality of the available information. By comparing the statistics forming the basis of many present planning exercises it was found that the share of traditional energy sources (including wood) was often found to have been underestimated in the official statistics by 50 to 300 %. The main reasons for the variation in estimates are the scale and nature of the interactions between resources and use, and the variations in time and place. Most of the aggregated statistics at national level have ignored this diversity. Other common problems in the use of official data include insufficient distinction between domestic and industrial/commercial users, between rural and urban users, and lack of time series data providing insights in the evolution, development and adaptations of the users and producers of woodfuels to changing conditions. The type of research and surveys that have been implemented have often been found to be unable to capture the diversity and complexity. Hence we may have the consumption data of certain categories of consumers (often rural household data are available) in specific areas or nationwide, but then the consumption by urban households may be lacking, or even more often the use by rural and urban industries and other commercial establishments. The implications of these inadequacies in information for the perspective on wood energy and its potential for development are many.....and all negative:

2.1 By underestimating the share of wood and other forms of biomass to total energy consumption, the importance of these resources for the national economy is underestimated. This is reflected in a low contribution to the GDP by the forestry sector.

2.2 This underestimate is aggravated by the ignorance of the incomes and employment generated in producing and trading wood fuels, and the implications for these incomes resulting from policy induced substitution programmes.

2.3 The lack of information on the relative contributions from forest and non-forest lands and the resulting inadequate understanding of the interactions between resource management, wood fuel supply and demand, may easily give rise to overgeneralized impressions of supply-demand 'gaps', and the belief that a general reduction of fuelwood use may result in decrease of deforestation. Resulting in policy measures trying to reduce consumption and trade.

2.4 The main problem is that these inadequacies in information, together, prevent the realization of the great potential of fuelwood to simultaneously contribute to major national energy and forestry and environmental objectives, and that decisions based on such information constrains the attempts by the majority of the poorer people in Asia to improve their livelihoods.

3. OTHER IMPLICATIONS OF INFORMATION INADEQUACIES

These negative effects on the national and rural economy were underscored by *Mendis'* eloquent elaboration of the implications of not using the standard economic assessments in the planning of biomass development activities. He pointed out that standard approaches in the planning of conventional energy projects such as power plants usually include an analysis of the upstream and downstream effects. Such analyses are often not carried out for biomass projects, thereby introducing a bias against such projects, that is aggravated by inadequacies in national accounting and discounting procedures, which e.g., do not reflect the depletion of non-renewable resources. He pointed out that if these biases were corrected that the viability of biomass based energy development activities, particularly in the private sector would improve considerably. This would require a renewed commitment to the development of appropriate biomass energy conversion technologies, for both informal and formal sector industrial activities.

Heruela in his presentation of the status of wood energy planning in Asia, sketched the implications of inadequate information for the attention wood and related biomass fuels receive in national energy planning activities. Though most countries attempt to follow an integrated energy planning approach in which the needs of all sectors, and the supply of all energy sources is considered, the present situation was summarized in the statement that "the traditional energy sector, which in some countries of the region is estimated to form up to 80 % of the total energy consumed has been the *bete noire* of energy planners...."

It was pointed out that rural energy planning activities need to be highly decentralized, but that for the purpose of national energy policy formulation aggregation of information is required as well. This puts special demands on the strategy for database development, and the organization of data for planning and the energy planning models used.

The above may easily lead to the impression of a dismal future for a fuel that seems to be rapidly fading away in the march of progress and accelerated development. Three in-depth studies were presented that demonstrate that even in less conducive market and policy environments, the producers, traders and users of wood fuels may continue to think and act otherwise. The studies also indicate that wood fuels could not only represent an opportunity for

those involved in the wood energy business, but also for those charged with formulating and planning energy and forestry policies and programmes. The studies are not only exemplary in what was found, but also for 'how' valid and reliable information, useful for policy and planning purposes, can be obtained.

4. EXAMPLES OF RELEVANT STUDIES AND EFFECTIVE METHODOLOGICAL APPROACHES

Ouerghi presented an example of an approach to gain accurate information and understanding of biomass energy use by households in Pakistan. The government of Pakistan felt the need to integrate household energy in the national energy planning process. The main issue was related to the use of biomass resources and to establish whether the present level of consumption is sustainable; an aggressive interfuel substitution is justifiable; what are the prospects for increased biomass supply and what the broader policy implications of improved information would be.

The household energy strategy study project has attempted to answer these questions through an integrated supply resources assessment, woodfuel market study, and energy demand study. For the supply study, analysis of low-resolution satellite imagery was combined with geographic data to develop an effective agro-ecological zonation for the whole country. This provided a consistent sampling frame for estimating available fuel supply and for relating energy supply to demand. Next, twelve high-resolution satellite images (Landsat TM) were used for more detailed classification and selection field samples. Variable primary sampling was used for automated selection of 1100 primary sampling units based on their percent vegetation cover. The fuelwood supply measurements were done in these primary sampling units. This approach provided a sound basis for producing national estimates of woody biomass and crop residue availability for Pakistan. It also allowed the results of both fuel supply and demand studies to be accurately correlated and permitted the successful development of a household energy planning database for Pakistan.

One of the results of this approach is the refutation of the "gap theory" as it allowed for the understanding of the adaptation of rural resource managers to changes in resource situations. It was found that Pakistani farmers had planted around 125 million trees in 1990-91. Though few of these trees were "planted for fuel" a substantial part of the wood may be expected to become available for fuel. The importance of monitoring farmers's tree planting behaviour (through the agricultural census) is obvious. Another finding is the much greater importance of wood fuels in national energy use than earlier assumed.

The driving factors of fuelwood consumption were found to be: the household size, urbanization and income level. The study of the woodfuel markets indicated that 40 % of the woodfuels were traded, a business that generates annually the equivalent of US $ 450 million (equal to 10 % of the value of Pakistan's exports) and about 80 to 100 000 people are directly involved in this trade. It is estimated that there is a wood fuel trader for every 2 500 inhabitants in Pakistan. For the urban areas there may be some prospect for the development and commercial dissemination of better stoves. Such prospects are much less promising in the rural areas, where tree planting and resource management activities may need to be monitored.

One of the challenges is now to put this information in such a format that it can be used as the basis for a continuous policy, planning and implementation process, in which wood energy development is considered on a rational basis.

Participants from other countries showed great interest in the process developed and implemented in Pakistan, and expressed interest in an effort to adapt the basic 'integrated approach' of resources and uses, to their own countries. It may be expected that such adaptation could also reduce the cost of implementing such exercises elsewhere considerably.

Findings from a case study of the commercial wood fuel supply, trade and use in Cebu City, presented by *Bensel and Remedio*, confirmed much of the findings as presented above. Also here in an area that is for 99.6 % deforested (and has reportedly been in that condition since the end of the last century), wood fuel is supplied by farmers in a sustainable manner. Though Cebu City is undergoing rapid development, woodfuels continue to provide a significant portion of total energy use. It was found that the poorer households use fuelwood (including coconut fronds) as their primary fuel. Most of the better off urban households predominantly use LPG for fuel, but many households use fuelwood as a secondary fuel or as a fuel to prepare special dishes. Also a large variety of (small and larger scale) commercial establishment use woodfuels for their production processes. It was found that the trade and transport system is efficient and well organized.

The results from the study are contrary to what is popularly believed about the environmental effects of fuelwood use, it was found that in Cebu, rather than being a cause of resource degradation, much of the wood fuel system plays a crucial role in preventing it. Many proposals and programmes for resource development reflect inadequate awareness of this fact. Current thinking in both government and non-government circles demonstrate a gap in understanding of upland resource management systems in general and of the role of wood fuel resources management in particular.

The findings of the study also suggest that the current attempts to regulate the transport of wood urgently need to be revised.

A mix of methods, including a survey with structured questionnaires of users, semi-structured interviews, analysis of secondary data, oral history, telephone interview, observation and ocular inspection trips, was used. Traders proved to be most useful key informants providing information on categories of, particularly commercial and industrial users and sources of woodfuels.

That carefully 'mixed approaches' can also yield better insights at national level was illustrated by *Aida Pujanes* in her report on the rural energy needs survey, the household energy consumption survey and the study of the fuelwood supply systems in six urban areas in the Philippines. Though all these studies were principally carried out through formal questionnaires, the differences in design and focus of these studies provided useful complementary information, allowing for cross checks, and a more complete understanding of the processes involved in wood fuel use, trade and resources.

Much work to develop and systematize such mix of methods to improve the depth of understanding of rural resource systems, in a timely and cost-effective manner, has been carried out in the last decade at Khon Kaen University in Thailand. Results of the application of the Rapid Rural Appraisal approach to better understand the structure of charcoal making in Northeast Thailand were presented by *Opart Panya.* He demonstrated how this type of study can help in better understanding of a crucial dimension of wood fuel resource systems: the

adaptive strategies developed by rural resource managers and users to cope with changes in resource conditions and markets. He found that charcoal making in the Northeast provided income to people without other sources of income, particularly in times of distress and the slack agricultural season. He also found that most charcoal makers acquired their wood for charcoal making from farm and village lands. His findings suggest that enhancing the economic viability of charcoal making may under many of the conditions prevailing in this part of Thailand, bring about incentives for improved wood land management and tree planting, if accompanied by appropriate institutional support.

These demonstrations of effective ways of acquiring accurate and relevant primary information for wood energy planning, were complemented by four presentations discussing how such information could then be formatted and managed for decision-making, and the type of institutional arrangements that should be considered.
Also, two examples of international support in energy planning development were presented.

5. APPROPRIATE ENERGY PLANNING MODELS, ARRANGEMENTS AND INTERNATIONAL SUPPORT

Charlie Heaps presented (and later demonstrated) the Long Range Energy Alternatives Planning Model (LEAP). Early attempts to model the 'woodfuel crisis' were based on a number of -what are now perceived as simplistic- assumptions, in which the per capita consumption of a growing population was confronted with a declining resource, leading to rapidly growing 'gaps' to be closed by LPG, trees and stoves.

LEAP attempts to avoid falling in this gap (or trap) by taking the following into account: biomass sources in all sorts of land uses, a dis-aggregated approach enabling the capture of interactions between resources, management, supply and uses; wood growth patterns; adaptability to various levels of data availability; and accounting for modern biomass options. Assistance in planning is through a scenario approach, through which the physical, economic and environmental impacts of different scenarios can be evaluated.

A special biomass module is presently being further developed, comprising land use modules, results from biomass inventories, as well as the demand and transformation characteristics of various biomass fuels, enabling an assessment of the adequacy and impacts of selected scenarios on the Biomass Resource Base.

In addition to this type of computer assisted approach, two other types of PC based applications for wood energy were demonstrated: *Veena Joshi* demonstrated the database of results of over 600 rural energy surveys that have been done in India. She explained that such databases could serve a variety of purposes: It could prevent the organization of 'another survey' by making the results of inaccessible reports available. It was also explained that most district offices in India now have access to PCs, and that making appropriate software available could assist in the efforts to decentralized planning that is particularly relevant in rural energy planning.

George van der Meulen demonstrated the RWEDP supported development of a simplified GIS decision support system. An attempt to make the use of relevant geographical information (developed by research institutions) accessible to planning institutions and allow for the identification, monitoring and evaluation of sites for specific wood energy development activities.

All emphasized in their presentations and demonstrations that models do not solve problems, but that they can only assist researchers and planners in their attempts to tackle the problems at hand.

Another requirement for success in these efforts was presented by *Veena Joshi*, in discussing some of the institutional requirements for rural (and wood) energy planning.

She presented the policy objectives in the energy, forestry, and rural development sectors, that are of particular importance for wood energy development. Relevant energy policy objectives include the control of the demand for imported fossil fuels, environmental protection, and the promotion of renewables; in forestry the objective of protection of the environment is complemented by the objective to meet the local fuel and fodder needs. In India, integrated rural energy planning is part of the rural development programme.

These 'multi-sector' national policy objectives demonstrate the importance of, and provide the justification for, rural (and wood) energy development.

She advocated a decentralized approach to rural energy planning, and the careful selection of problem areas for planning and implementation of activities. As a start rural, semi urban and urban areas should be distinguished, particularly for the identification of system boundaries the differences between these different types of areas are important. She also pointed at the large number of institutions to be involved in such exercises at national, state, and district or block level. Capability building was identified as one priority to make decentralization work.

This type of decentralized rural energy planning is supported by (among others) FAO's Research and Technology Development Division. Particularly the formation of appropriate institutional arrangements for such decentralized planning and implementation of rural energy development is supported. *Miguel Trossero* presented the principles and the pilot activities in the Philippines, Indonesia, Sri Lanka, Laos and Vietnam.

Another international support programme was presented by *Jean-Yves Garnier,* adviser to the ASEAN-EC Energy Management Training and Research Centre, based in Jakarta. He presented an overview of the importance of biomass energy in the 6 ASEAN countries, and AEEMTRAC's activities in biomass energy modelling.

The plenary presentations and discussions summarized above, formed the basis of the discussions in the 5 times that the three working groups met. The findings of the groups, discussing energy demand and policy issues; wood energy supply and forestry policy issues; and data assessment and analysis issues and strategies, are summarized in the appendix.

APPENDIX

Summary Findings of Working Group 1 - Energy

Facilitator:	**Mr. Suwarmin**	**- Indonesia**
Participants:	**Dr. Aroon Chomcharn**	**- RWEDP**
	Mr. Gopal Mahat	**- Bhutan**
	Mr. Dhan Lall Shrestha	**- Nepal**
	Mr. Wijeratne	**- Sri Lanka**
	Dr. Charit Tingsabadh	**- Thailand**
	Ms. Ruby T. Buen	**- Philippines**
	Ms. Shubhra Bhatia	**- India**
	Ms. Nenny Sri Utami	**- Indonesia**
	Mr. M.N.A. Katebi	**- Bangladesh**
	Dr. Veena Joshi	**- TERI**
Rapporteur:	**Mr. Matthew S. Mendis**	**- AED**

BACKGROUND

1. The "Energy" Working Group of the RWEDP - Regional Expert Consultation on Data Assessment and Analysis for Wood Energy Planning was charged with the task of discussing the "issues relating to **wood energy supply** and its implications on the linkages among energy, forestry and other relevant sectors". The group met for informal discussions on four seperate occasions during the period of the RWEDP Expert Consultation. The group took as it guidelines the "framework for discussions" that were provided by the Secretariat of the RWEDP. The following is a summary of the findings, conclusions and recommendations of the Energy Working Group.

PROBLEMS AND OPPORTUNITIES IN WOOD ENERGY DEVELOPMENT

2. The Energy Working Group discussed specifically the problems and opportunities in wood energy development as it related to other sectors and sub-sectors of the economy. In this regard, the Energy Working Group concluded the following:

   (a) Energy Sector:

   Prob. Wood and biomass energy will continue to be a major component of total energy consumption in many developing countries in the region for the foreseeable future. However, there is little understanding and reliable information on the extent of wood energy supply and demand within the overall energy sector of most developing countries. This is particularly true where wood energy is utilized as a "non-commercial" fuel by the rural poor. There is also a weak understanding of the of the market mechanisms of the wood energy ssub-sector.

Opp. Structured wood energy development will result in a positive contribution to the overall energy sector needs of the countries of the region while simultaneously developing an indigenous and sustainable energy resource.

(b) National Economy:

Prob. The value of wood energy (especially when used as a "non-commercial" fuel) is not adequately accounted for in the national income accounts. National and, in many cases, local institutional accountability for the role of wood energy in the national economy is generally non-existent.

Opp. Productive activites (such as agro-forestry, village woodlots, energy plantations, etc.) that result in increasing the supply of wood energy can be further supported and expanded. Expanding the supply of wood energy where economic and feasible can help reduce the level of imported fuels used especially in the rural domestic, commercial and industrial sectors and the urban low-income domestic and informal sectors.

(c) Agriculture and Rural Development:

Prob. Trees are not a significant part of the present farming system in most countries of the region. In the past, expansion of agricultural land has been at the expense of forests and tree growing land. In many cases, this expansion of agricultural lands has been a more significant contributor to the problem of deforestation and loss of tree growing lands. Agricultural land use and tenure patterns in many countries also inhibit wood energy development in conjunction with agricultural and rural development.

Opp. Wood energy development can have a positive impact and contribute greater value added to agriculture. Wood energy development can also provide additional income for the farmer. Wood energy development in association with agriculture generally has positive local environmental benefits such as soil preservation and watershed management. From the perspective of rural development, programmes for wood energy development can result in rural employment, income generation for women and unskilled labor and requires low capital investments.

(d) Urbanization:

Prob. Increased urbanization has resulted in increasing significantly the pressure on wood energy supply in the vicinity of the urban centers. In most instances, programmes for wood energy development to meet the needs of urban areas have not kept pace with the rapid urban growth rates resulting in rapid wood energy price increases, dislocations of fuel supplies and economic hardships especially for the lowest income groups in the urban areas.

Opp. Urbanization provides an opportunity for the market forces to work thereby providing monetary benefits for wood energy development. However, in many instances, this monetary value has not been reflective of the true economic value or replacement costs of wood energy resulting in the accelerated mining of the resource in the surrounding urban areas.

(e) Industrial Development:

Prob. Wood energy has been an important factor in supporting small-scale rural and urban industries. However, the growing scarcity of wood fuels theaten the survivability of these industries. Therefore, wood energy development is an important factor if the economic viability of these industries is to be sustained.

Opp. The use of wood energy, especially within rural industries, like urban woodfuel demand provides an opportunity to capture the economic value of wood fuel production if correctly priced.

(f) Environment:

Prob. The inappropriate/inefficient use of wood energy in the household and commercial sectors can contribute to indoor air-pollution and human health hazards especially for women and children. Wood fuel supply derived from non-sustainable sources will also result in land degradation and other local environmental impacts. Wood energy development done with insufficient background research can result in agricultural and silvicultural problems.

Opp. Wood energy development can help in reclaiming degraded/marginal/deforested lands. Wood energy development can also have positive environmental impacts on watershed management and land use. Sustainable wood energy development can contribute to reducing the rate of carbon emissions to the global environment while meeting the growing energy demands of countries.

(g) Women:

Prob. The continued use of wood energy as a primary souce of domestic fuel in traditional stoves and kitchens will continue to have negative impacts on the health of primarily women and children due to exposure of smoke and other combustion emissions. The scarcity of wood fuels tends to impact, more directly, the welfare of women as they are the primary gatherers of wood energy.

Opp. Wood energy development provides additional employment and income opportunities for the rural women and the disadvantaged.

STRENGTHS AND WEAKNESS OF THE ENERGY SECTOR IN SUPPORT FOR WOOD ENERGY DEVELOPMENT

(a) Policies:

At present, energy policies in most countries are weak or non-existence in regard of support of wood energy development. Reasons include: (i) no representation of wood energy advocates in the national policy development framework; (ii) other sectoral policies tend to have a negative impact on wood energy development; (iii) the myth and fear of deforestation have led to the omission of policies that would support wood energy development; (iv) there is and inadequate understanding of how the wood energy sector works as a system and what is needed to support it; (v) there is a prevailing perception that no major investments are needed for the support of wood energy

development and that wood energy development is independently triggered and self sustaining; and (vi) the present institutional structure of the energy sector favors centralized/commercial energy sources and is not conducive to managing many critical wood energy development issues. The present trend for decentralization and privatization of the energy sector in many countries of the region could also lead to difficulties in formulating a coherent wood energy development policy that addresses the non-commercial aspects of wood energy.

(b) Plans/Programmes/Strategies:

Due to the general weakness of wood energy policies in most countries, plans, programmes and strategies for wood energy development are also weak, inappropriate or non-existent.

(c) Linkages:

Wood energy development with regards to supply requires the active participation of the land development authorities and including the forestry, agricultural and energy sectors. The general weak linkages between land development/use the forestry, agriculture and energy sectors has hampered a corrdinated development of wood energy.

RECOMMENDATIONS AND PRIORITY ACTIONS IN THE ENERGY SECTOR

(a) The contribution of wood fuels to the national energy requirement must be recognized and acknowledged. Within this context, the contribution of wood energy to the national economy and welfare must also be recognized.

(b) In recognition of the above, the formulation of a coherent wood energy development policy framework must be undertaken.

(c) There is a need to coordinate the efforts of the various sectoral institutions in achieving a coherent wood energy development policy.

(d) There is a need to regularly develop and update reliable data on wood energy to support the formulation of policies. This should be a regular part of the compilation of national energy statistics.

(e) The lack of adequate trained and informed personnel to carry out supportive wood energy development activities must be addressed.

(f) There is a need to develop appropriate, reliable and cost effective wood energy supply and conversion technologies.

(g) New planning approaches are required to address the issues of scale and adoption of technologies in the household sector. In developing these new approaches, the involvement of end users is necessary.

Working Group II - Forestry

Issues Relating to Wood Energy Supply and Its Implication on the Linkages Among Energy, Forestry and Other Relevant Sectors

Topic 1: Production of woodfuels from forest and non-forest sources.
Topic 2: Nature of wood fuel flows/wood fuel markets.
Topic 3: Policy and institutional implications and recommendations.

ISSUES	NATIONAL FOREST LAND
POTENTIAL	* Non - Timber Trees: - Natural (10%) - Plantation (10%) * Logging Wastes (30%) [TENTATIVE!!!!] * Milling Wastes (40%)
IMPACT	* Positive impact on rural income and employment * Positive impact on local energy supplies
CONSTRAINTS	* Physical accessibility to supplies * Social accessibility to supplies (i.e. ownership, legal questions) * Legal/Policy constraints with regards to access * Alternative uses for logging/milling wastes and non-timber trees * Legal constraints on protected species * Limits on access to forest preserves

ISSUES	PRIVATE LAND
POTENTIAL	* Woodfuel Plantations/Other Plantation wastes * Fruit Trees * Agro-Forestry * Marginal Land Plantation * Agricultural Residues
IMPACT	* Negative impact on potential food production of tenants and nearby landless * Positive impact on local income an employment * Positive impact on local environment (soil enhancing, erosion control, etc.) * Positive Impact on land productivity, increased intensity of land use
CONSTRAINTS	* Competing land uses especially for other agricultural purposes, urbanization * Uncertain land tenure * Types of species to be used * Competition with livestock (with respect to marginal lands) * Accessibility to markets/existence of trading network * Loss of potential fertilizer in form of crop residues

ISSUES	COMMON LAND
POTENTIAL	* Covers all types of common lands used for woodfuel collection
IMPACT	* Existence of common lands is positive for poor/landless, helps in equitability of access * Potentially positive impacts in terms of income/employment opportunities
CONSTRAINTS	* Management of common lands based on stable social systems that are now breaking up and rendering traditional management methods inappropriate * Increasing appropriation of common lands by local influential * Ambiguity of existence

Issues Relating to Linkages

* Link importance of wood energy in national economies with overall energy balance tables.
* Integrate wood energy issues and development in to forestry master plans and programmes.
* Linkage also works the other way, energy people need to consider developments in forestry sector.
* Broader linkages between wood energy, forestry, agriculture/land use, economic development (especially rural and NGOs).

Participants

1.	Bein	Myanmar	Energy
2.	Dwiprabowo	Indonesia	Forestry
3.	Gusain	India	Energy
4.	Karki	Nepal	Forestry
5.	Wilas	Thailand	Development

6. Opart Panya -- Facilitator

Occasional Participants

Pelinck	RWEDP
Bensel	Philippines
Koopmans	Chiang Mai/Thailand
Trossero	FAO/Rome

Conclusions of Working Group 3 - Wood Energy Planning

The third working group enjoyed a feree ranging discussion which resulted in the following comments, conclusions and recommendations, which we hope will be found useful.

Inevitably woodfuel issues are often given low priority when other more pressing problems such as poverty and the provision of family planning, health care, water and sanitation also loom large. Nevertheless, woodfuel and biomass energy issues were identified as serious problems.

The identification of problem areas and the development of solutions must arise from a "bottom-up" participatory approach to energy planning. It is emphasized that energy planning cannot be carried out in isolation from wider development planning. National energy, forestry and agricultural plans all need to be placed within an overall development framework. In all countries, better coordination is requied between the ministries responsible for these issues. Overall, more attention needs to be given to wood and other biomass fuels in developing national social, economic and environmental policies. Incorporating woodfuel resource data in particular, and biofuel data in general, into published national accounts is suggested as one way to give these issues a higher profile in the planning debate.

The lack of primary data in most member countries is hampering energy planning efforts. Lack of non-forest resource data (e.g. for farm trees and bushes and shrubs) is one example of an area where reliable quantitative data is lacking. Furthermore, because of a lack of common definitions and a lack of consistency between different studies conducted in member countries, it is often difficult to place reliance on secondary data sources.

Human resource and financial constraints on institutions are thought to be a major problem. Shortages of skilled manpower and funding restrictions limit what can be achieved by forestry departments and energy ministries. In particular, more resources are needed for the training of field workers. A disproportionately large amount of funding is allocated to consultancy. Better value might be gained from limited available funds by making more use of the regions own experts.

The current FAO expert meeting has been a valuable forum for the exchange of ideas, information and experiences. It is important that such exchanges continue in the future. Projects such as the one currently being completed in Pakistan (HESS) will be an important source of information for the region. Data, methodologies, and other lessons learned from this study need to be communicated to other countries in the region. Efforts should be made to adapt and generalize the methodologies and data developed as part of the Pakistan study.

Suggested Ministerial Responsibilities in Woodfuel Planning

Planning Phase	**Ministerial Responsibility**
Assessment of Wood & Biomass Resources	Forestry/Agriculture
Assessment of Consumption	Energy
Integration, Analysis & Planning	Inter-Ministry Coordination
Extension Services Implementation	Forestry
Conservation Implementation	Energy

Wood Energy: Towards Appropriate Policies and Strategies

by

John Soussan[1]

1. INTRODUCTION

This paper has been prepared for the FAO/RWEDP seminar on policy instruments for the implementation of wood energy development programmes. The arguments presented here[2] reflect several years work on analysing fuelwood problems and solutions in South and South-East Asia and elsewhere, and in particular builds on an analysis of the nature of fuelwood problems derived from a series of fuelwood and community forestry project formulation and evaluation missions in this region.

The goal of this paper is to "set the scene", through presenting a picture of the ways in which wood and other biomass fuels are produced and used within the context of local production systems. A central theme is that both fuelwood problems and potential solutions to these problems are specific to people in places. If policies in this area are to be successful they must be able to capture this local specificity and build on the particular ways in which the people who count - the actual uses of biomass fuels - respond to the problems they face and the opportunities the perceive.

This is not to suggest that fuelwood issues can only be understood or addressed at the micro-level: indeed, a sister paper to this one argues that an appropriate policy environment is an essential pre-requisite to many local initiatives. What is argued is that fuelwood production and use is a complex process which varies in crucial details over small distances. This needs to be understood and engrained in the approach to fuelwood interventions which "outsiders" (whether from national governments or the international aid community) attempt to place on the ground. A "single club", technology-driven approach to fuelwood is doomed to failure, as it invariably attempts to impose a solution on the ground. Such an approach limits the choices open to the local community and frequently demands of them inputs which affect other aspects of their lives.

The key to success is to adopt project approaches which increase the range of secure and sustainable choices available to the local actors and enable them to devise their own solutions. Our role should be to increase the options available through providing missing or deficient inputs (including knowledge where needed) and helping to develop the local institutions which empower all sections of the community to have secure access to the local resources which are the source of their basic needs, of which fuel is but one.

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[1] ETC Foundation and Reading University, U.K.

[2] Much of the material used in this paper draws strongly on work done in co-operation with Evan Mercer of Duke University in preparing a paper on fuelwood for the World Bank's Forest Sector Policy Review in 1990. More complete forms of these arguments can be found in Soussan et al (1992a), Soussan et al (1992b) and Mercer & Soussan (1992).

2. THE APPROACH

This paper examines the nature and origins of fuelwood problems; identifying the main factors causing fuelwood stress and resource deterioration. It focusses on the relationship of fuelwood problems to other development issues, the forms fuelwood problems take and features of local fuelwood production and use systems which offer potential opportunities for effective and sustainable interventions.

Concern over the fuelwood crisis facing the world's poor has been with us for some time now (Eckholm et al 1984, Soussan 1988, Agarwal 1986). As is often the case, there was at first a tendency to overstate and simplify the problem, with projections of the decimation of the biomass resource base of many areas advanced. This was usually based on a projection of assumed supply and demand (the so-called "gap" analysis), and was highly influential for some time (Leach and Mearns 1988). The World Bank/UNDP energy sector assessments of 60 countries were based on this approach, as were a range of influential FAO studies. This led to a series of project interventions which sought to boost fuelwood supplies regardless of local needs, priorities or resource potentials and with little attention paid to the economic viability of the plans.

This approach is now widely discredited, and we have begun to understand that fuelwood stress is rarely generalisable. The high level of aggregation, based on numbers of dubious quality and a series of assumptions about the relationship of fuelwood use to deforestation, removes this approach from the reality of events on the ground (Leach and Mearns 1988). This is exacerbated by the forecasting methods used, which assume that fuelwood demand rises linearly with growing populations whilst supplies are a fixed and dwindling resource. It acknowledges no response to scarcity on either the demand or supply side consequently misses the dynamics which lie at the heart of systems of fuelwood production and use (Munslow et al 1988, Soussan 1988). Fuelwood use and scarcity reflect complex and variable interactions between local production systems and the environmental resources on which they are based. The analysis of fuelwood problems presented in this paper centers on these interactions, and is based on an understanding of energy needs in relation to the wider production system.

Much of the complexity associated with fuelwood production and use stems from two sets of factors. Firstly, the existence of biomass resources in a locality is insufficient to guarantee that all who need them have enough fuel available. They must have access to the resources; access which can be constrained by location, land tenure and land management practices (ETC 1987, Soussan et al 1991). Fuelwood problems do not affect whole communities uniformly: it is usually the poor who are hit first and hardest. Secondly, fuelwood problems do not express themselves as a simple and direct shortage of fuel. As resource stresses emerge people respond according to the opportunities open to them. These responses are variable, indirect and locality-specific (Soussan 1988).

The significance and origins of fuelwood problems in, for example, a semi-arid area such as Rajasthan are very different to those found in a mountainous region such as Nepal or a high population density/high productivity area such as Java. A further sharp distinction should be drawn between rural localities (where fuelwood is usually a free good gathered locally) and urban areas (where woodfuels are a commodity produced elsewhere). The policy options which are appropriate for each of these different sets of circumstances will similarly be varied. To work, fuelwood policies must be tailored to the specific circumstances of people in places.

The causes of the resource stresses which underlie fuelwood problems are as complex and varied as the forms fuelwood problems take. In rural areas they reflect changes to economy/environment relationships which affect local biomass resource supply/demand patterns (Armitage and Schramm 1989). These changes can be gradual: for example, land colonization which erodes local woodlands, increased herd sizes in semi-arid regions, increasing exports of woodfuels to meet growing urban demands or changing agricultural practices which result in lower quantities of residues available as fuel. In some cases the changes can be sudden and catastrophic in impact: for example large scale deforestation associated with giant development schemes, mass refugee influxes, environmental collapse associated with droughts, floods or other extreme climatic events or collapsing commodity prices. Whether gradual or rapid, these processes of change lie at the heart of fuelwood problems. They set clear limits on the opportunities open to effectively confront them. Fuelwood problems must be approached from a dynamic perspective, and must be related to trends in the development of the regions in question. In this paper these sets of factors will be examined to identify the significance, forms and causes of fuelwood problems.

3. FUELWOOD USE, SUSTAINABLE DEVELOPMENT AND ENERGY NEEDS

The role of energy in existing and desired development patterns must be understood before fuelwood problems and solutions can be discussed. This section discusses briefly a number of background issues, but there is inevitably not the room to do any of them justice. Despite this, they must be raised if fuelwood policies are to be given a meaningful context. There is a wide awareness that the context of energy policy has changed in recent years. The dual crises associated with oil and woodfuel resources have largely receded to be replaced by more complex concerns with the economic implications of debt burdens and restructuring policies and a wide range of environmental issues at local, national and global levels. The key issue is not how to supply more energy (in whatever form), but rather how to ensure that the energy needs of sustainable development paths are met in the most effective manner. For energy, the key is to define energy need, not resource availability. This in turn relates to the existing development trajectory of specific places and the policies which can support this development path through the provision of adequate, secure and appropriate energy supplies.

Much uncertainty surrounds the meaning of sustainable development (Pearce et al 1989, Redclift 1987) and there is not the space here to discuss this issue fully. In essence, sustainable development is a call for policies which maximise growth without jeopardising the position of vulnerable people or depleting the future viability of the resource base. It seeks to redress the dominant policies of the past, which have sought growth alone, but is also not anti-development. Sustainable development recognises that existing production systems cannot survive unaltered in a changing world. They must adapt to new circumstances if they are to continue to provide for the needs of the majority of the world's poorest people.

Current patterns of economic development in many regions are not creating patterns of sustainable change and are failing to meet the needs of the most disadvantaged. In many cases traditional growth-oriented policies are failing in their own terms: throughout Africa and Latin America in particular the 1980s saw widespread economic decline and severe deterioration in the macro-economic health of many nations. Asia fared somewhat better, and indeed now contains most of the world's more vigorous economies. Even in Asia, though, there are many tens of millions who have seen few, if any, benefits of global development and whose daily experience is of deteriorating resources and greater problems.

This economic crisis is a vital conditioning factor for effective fuelwood policies. Real tensions exist between these long-term development goals and short-term economic necessities (Soussan 1990a). Capital and foreign exchange are scarce, inhibiting both investment decisions and the ability to pay for imported fuels and technology. For many of the poorest countries this is compounded by economies which are small and vulnerable to international economic cycles and weak institutional and human resource capabilities. Above all, the burden of debt servicing undermines many other policy hopes and directions (George 1988). Fuelwood stress is also conditioned by social and demographic trends within Third World countries. Population growth and urbanization are changing the ways wood resources are managed and are producing new forms of fuelwood stress. There is some debate over the significance of population growth rates. Concern is frequently expressed over the scarcity of wood resources and the viability of the land resource base, but these fears tend not to take full account of the significance of urbanization processes. Urban growth rates of up to 10 percent per year are common and what were rural societies are becoming increasingly urban-focused throughout much of Asia. Urban populations will outstrip rural ones in most countries during the next generation, and in many areas rural populations will grow only marginally or even decline in the future. Already some areas face key labour shortages in agriculture; a pattern which will become more widespread whilst rural opportunities continue to be so limited. In some areas these labour shortages are as significant in the origins of fuelwood stress as demographic pressures are in other localities.

Resource pressures derived from population growth do exist, and in particular can be found in mountainous, semi-arid and other fragile environments (Ryan 1990a). In this, fuelwood use cannot be separated from other forms of land resource exploitation. These pressures are more to do with livestock populations, the alienation of rural communities from land resources and, in some cases, mass refugee flows driven by military or environmental disasters than simple demographic growth. The spectre of widespread environmental collapse associated with demographic trends can be discounted. The corollary of this conclusion is that urban energy demand is of increasing importance, and for many countries will be the dominant energy policy issue in the near future.

There is agreement that the different circumstances of different people and places make generalizations about fuelwood stress problematic. In this paper we aim to draw out common issues and processes, not to outline prescriptive "blueprints" for fuelwood policies. Policy formulation must be sharply focussed to take account of the locally-specific nature of fuelwood use and problems. To do this we need to understand the complex sets of interaction between economic and environmental factors which structure the ways in which biomass resources are managed.

4. FUELWOOD USE IN RURAL AND URBAN AREAS

Fuelwood use in the growing cities of the Third World contrasts sharply to the more familiar patterns of rural areas. This distinction between rural and urban fuelwood use, problems and solutions is fundamental to the issues discussed in this paper. We outline the basic features of fuelwood use in these areas here, and go on to discuss the issues this distinction between rural and urban areas raises in the rest of the report.

Despite the growth of energy use in other sectors, rural household consumption still dominates the energy budgets of many Developing Countries, and is particularly a feature of the poorer nations of South Asia. It constitutes over 75% of energy use in countries such as

Nepal, Bangladesh, most of India and Myanmar (Soussan 1988). Most of this energy use is for cooking, and most is supplied by biomass fuels (agricultural residues as well as woodfuels). In most cases these fuels are gathered freely from the local environment, and their production and use cannot be readily separated from other aspects of land resource management within rural economies. Rural people rarely fell trees for fuel use, and mostly depend on trees within close access to their homes. This means that trees outside the forest, within the agricultural landscape, are the main source of fuel for rural people. Fuel gathering is usually the job of women, often helped by their children (Agarwal 1986, Munslow et al 1988). Rural fuelwood problems are consequently closely associated with gender issues in rural areas. The reliance on local land resources also means that control of these resources, and as a consequence land tenure systems, is important.

Rural fuelwood is not usually a commodity, but of course there are costs associated with its acquisition and use. Many of these costs are indirect, but they can seriously de-stabilise rural production systems where resource stresses emerge (this issue is discussed in greater detail in the following sections). For the poor, in particular, there is no alternative to these fuels as a basic subsistence need, and problems associated with access to woodfuel can be considered as an integral part of the wider development crisis the rural poor face. Rural fuelwood use will be with us for the foreseeable future whatever happens to energy resources and prices at an international level. This essential fact must be recognised and used as a starting point for the development of policies to confront rural fuelwood problems where they are found.

The significance of urban fuelwood use is growing rapidly as urbanisation proceeds apace (Soussan et al 1990b, Floor 1987). In urban areas woodfuels are commodities, and are in a direct price relationship with alternative commercial fuels such as kerosene and LPG. As in rural areas, in cities most woodfuels are used in the household sector (although their use in small industries such as restaurants, bakeries and brick kilns can be significant locally). In urban areas we are essentially concerned with consumer behavior in fuel markets. The concept of an energy transition is central to any understanding of household energy in urban areas. As urbanisation proceeds there is a tendency for fuel use to increase, diversify and switch from wood and charcoal to commercial fuels. This is driven by consumer preference; people prefer modern fuels, and will use them where they can. Recent studies (Leach and Mearns 1988, Soussan et al 1990b) suggest that in most cities woodfuels are not cheaper than the commercial alternatives. Rather, they are more reliably available, are sold in small quantities in local markets and do not require expensive initial investments in cooking stoves.

A central issue for any understanding of urban fuelwood problems is the structure of urban fuel markets. This, along with the effect of government policies which influence fuel prices and availability, will dictate which fuels are available at what prices to urban consumers. The stages in this transition are typically not discrete; it is common to find several fuels used for, in particular, cooking (again the main fuel use in most households). Urban fuelwood problems are an important and growing issue. The cost of these fuels to urban consumers (especially the poor) can be significant, and there is some (though patchy) evidence that in many places these costs are increasing. A more general problem is security of fuel supplies (ETC 1987). Markets for many commercial fuels are very poorly developed, and are particularly bad in peripheral neighborhoods where many of the poor live (in contrast to woodfuel markets, which usually reach all corners of the city). This often reflects government policies, which restrict imports and the internal distribution of commercial fuels.

Finally, urban fuelwood and charcoal markets can have a devastating impact on the rural areas from which supplies are drawn. In contrast to rural fuelwood use, urban dealers

often clear fell woodland areas and make no attempt to conserve the resource base. In effect, they are mining the resources, and pay only the extraction costs for them. The impact on both the rural environment and the needs of local people (through affecting supplies of fuels and other forest products) can be devastating.

This discussion of rural and urban fuelwood use illustrates the point that understanding these problems involves far more than crude estimates of supply and demand. Fuelwood use and problems must be addressed in relation to the control and management of land resource systems. We address some of these complexities in the next two sections of this paper.

5. ACCESS AND ALTERNATIVE USES

The existence of fuelwood resources in a locality is not enough to guarantee that no-one experiences fuelwood problems. These resources must be available for use by all who need them. This is frequently not the case, and we can identify a series of factors which limit access to wood resources (ETC 1987, Johnson and Tomkins 1989). Once again, we must stress that the form these access constraints take is highly locality-specific. They are one of the factors which must be accounted for before detailed plans are developed for any place.

Three broad groups of access constraints can be identified in rural areas (in urban areas access to fuels is a function of income and the development of fuel markets). These are limitations imposed by the location of the resources in relation to demand, by land tenure and ownership of biomass resources and, finally, by the way in which biomass resources are managed. Let us consider each of these factors briefly.

The locational limitations on access reflect features of the landscape. Most important is the distance between the sources of supply and the point of use. In many localities biomass fuels are gathered freely from the local environment, and the main cost of fuelwood use is the time taken by, usually, the women of the community to collect the fuel (Agarwal 1986). Carrying large bundles of wood is also physically demanding. Resources beyond a certain distance will take too long to collect.

The time taken to collect fuels is also influenced by features of the terrain such as hills, rivers, gullies and so on. An unclimbable hill or a deep river may act as an absolute barrier, whatever the physical distances involved. More frequently, steep slopes, rugged terrain or watercourses are not insurmountable barriers, but do add significantly to the collection time. As such, locational constraints on access can be calculated in relation to the benefits accrued for the time and effort taken. Whether people are willing to pay this price depends on the alternatives to wood available, their income and the opportunity cost of the collectors' labour time.

A series of access constraints come from the legal status of land in an area. The availability of biomass resources inevitably depends on their ownership, which in turn is a function of the ownership of the land on which they grow. Three broad categories of land tenure can be identified for our purposes:

1) Land owned individually by the local community - basically private farmland.
2) Land owned by the state, large commercial producers or other institutions controlled from outside the area - plantations, commercial farms, state forests and so on.

3) Land resources which are "common" - legally owned by the state or through customary communal forms but with no legal proprietorial restrictions upon access to them - open rangelands and woodlands, hillsides, grazing lands etc.

Biomass resources (both residues and trees on farms) from private farmland are the main source of fuel in many rural areas. Clearly access to them depends on their ownership. As such, land distribution is a critical factor in understanding fuelwood problems. Households with little or no land will face severe restrictions on access to fuels even if there appears to be a local surplus. In many cases (and in particular where there is a long tradition of uneven land distribution) land-poor and landless families have traditional rights to collect fuels from the land of larger land owners, but such rights are eroded where biomass resources are under stress or become commercialised. The direction of rural change, with greater commercialisation, new technologies which reduce tree coverage and residue production and higher population densities in many areas, has been to make inequalities of access to private biomass resources worse.

Access to wood from large scale commercial farms, plantations or forest reserves is frequently highly restricted or prohibited altogether. Some limited collection rights may be allowed and illegal removal is common, but if the managers of these resources use them for fuel (for example, for crop processing) or sell them (for fuel, timber, pulp or other uses) then access is limited by the policing action they take. The same may be true where the management has a conservation objective, as in forest reserves, which excludes the use of forest products by local people. This category of land frequently contains a significant proportion of the biomass resources of a locality, and even if limited collection is allowed these resources are alienated from the effective control of local people.

Access to biomass resources on communal land is the most complex of all. It is normal to find a range of traditional customs and practices which regulate access to them, but these tend to break down as local economies change and resource pressures increase. They have no significance where outside groups, such as urban wood dealers, exploit the resources. Similarly, they are rarely taken into account when state policies on the management of these areas are formed. Increasing tensions between the customary rights of local people and the practices of the state (usually personified by the forestry department) characterise many areas. The amount of communal land is rapidly declining in many areas as woodlands and rangelands are cleared and enclosed for agricultural production. As such, in these areas the lack of limitations on access can result in the unsustainable exploitation of what are often vital but fragile resources. For many, Hardin's "tragedy of the commons" is becoming a daily reality.

The final category of access factors are those associated with the system of biomass resource management. This will reflect the prevailing social structure, resource management and harvesting techniques, non-fuel uses of different categories of biomass resources and the rights and obligations of different sections of the community. One typically finds great differences according to gender, class, age and so on within a community over the control and use of biomass resources. Gender roles are of critical importance here, as fuel provision is frequently the women's responsibility whilst the men control the resources (especially land and cash) from which the fuel comes and which would need to be available for many interventions to work. This division of rights and obligations is a critical factor for the success of attempts to address fuelwood problems. The range of alternative uses for different types of biomass resource in a locality must be examined if the true nature of energy problems and potentials in a locality is to be understood. Box 1 sets out the range of other purposes for which wood and agricultural residues are valued by rural people. As ever, these are place-specific, but these alternative uses reinforces the point that one cannot understand the fuelwood situation simply

by looking at potential supply and demand. Indeed, in many places other uses, such as fodder or construction materials, are as or more important in both the quantities used and the value which local people assign to them.

Many rural people live in a biomass-based economy, and the local resource base conditions all aspects of their ability to meet their needs. The analysis of the availability and use of fuelwood must consequently be balanced against the critical importance tree and other biomass resources play in rural people's lives. We must take care that misguided attempts to intervene around one use of these products does not have adverse impacts on other uses for them. This is particularly true in situations of resource scarcity combined with unequal access, as single-objective interventions may improve the fuel position of some but deny others vital needs. In such situations it is, as ever, generally the poor and powerless who lose out and the privileged who gain.

Box 1
Alternative Uses of Tree Products and Agricultural Residues

Tree Products

Construction	Wood for houses, fences, granaries, etc. Needs good quality wood, with long poles preferred.
Tools	Wood for implements, boats, carts, household utensils. Needs good quality wood, with certain species preferred,
Domestic Fuel	Fuelwood is the main fuel in many rural areas. Dead wood or small branches lopped form trees are used. Whole trees are rarely felled for domestic fuel use.
Specialist Fuel	Ceremonial use (eg funerals, weddings), economic activities such as fish or crop drying, beer brewing, brick making etc. Often larger pieces of wood used.
Fruit & Food	Fruit, nuts, edible leaves, honey from hives in trees, etc are important supplements to rural diets, adding essential variety to the grain staple.
Fodder	Trees are an important source of fodder, both in pastoral areas and for livestock in arable areas.
Environmental	Trees around homesteads, in fields, on slopes, etc provide protection and shade, help secure soils and retain water and, through leaf fall, can add nutrients to the soil.
Specialist	Trees are a vital source of medicines, dyes natural fibers Products for rope, baskets and other utensils. They also provide insect repellents and a wide range of other products.

Agricultural Residues

Fodder	Crop residues are the main source of livestock feedstuffs in many areas.
Fuel	Crop residues and dung are essential fuels in many areas, and are particularly important where fuelwood scarcity is significant.
Soil Fertility	Manure and crop residues are essential for maintaining the productive potential of the soils in arable areas. They provide nutrients and protect soil structure more effectively than purchased fertilizers.
Construction	Straw, reeds, stalks and dung are used for roofing, walls and Utensils bricks, granaries, baskets and other essential items in rural areas.

6. RESPONSES TO FUELWOOD STRESS

Pressures on the biomass resource base are not simply a matter of fuel demand and scarcity; they relate to control over and the range of uses made of biomass resources. Where people are faced with shortages of biomass materials to meet these varied needs something has to give. What it is depends on local priorities and divisions of responsibility. In such circumstances, the needs of the poor and less powerful (women, the landless) take second place to those of those who control land and biomass resources. As is the case with other factors, biomass fuel stress is not derived from traditional forms of resource management. It is a product of the disruption of these systems; disruption which is in turn generated by a number of forces which vary in importance from locality to locality.

All this tells us that there is no simple, uniform fuelwood problem in Developing Countries. Such problems are complex and varied. They express themselves indirectly: not as a quantifiable shortage of woodfuel but rather as some form of disruption to the local system of land resource management. They are part of a wider process of resource stress which takes different forms in different places. The key to understanding this variation is the access notion outlined above. Fuelwood problems are best understood as stages in an unfolding drama, in which people respond to the resource stress they face in a variety of ways. Some of these responses are desirable and sustainable, and form the basis for effective interventions. Others produce negative impacts, with steps taken as necessary responses to an immediate problem resulting in the longer-term undermining of the local production system.

Such responses do not all happen at the same time. The initial ones tend to be gradual, often unnoticed changes within the existing structure of fuelwood provision and use. Others involve more dramatic adjustments in people's relationship to their land resource base, and tend to reflect a more profound crisis. One of the first responses to fuelwood stress found is more careful management of the fire to use less fuel. This can result in dramatic fuel savings (meaning that assumptions about a linear growth of demand with population growth have no validity), but they are a one-off gain inevitably limited by the laws of thermodynamics. This conservation consciousness does take extra time (though this is offset against the reduced time needed to collect the fuel), but results in efficiency gains which are desirable and sustainable.

Continuing fuel scarcity can produce other changes in cooking practices which are less clearly beneficial. Enclosed stoves may be adopted, losing other functions of the fire such as light, heat and a social focus. The number of meals cooked per day may be reduced or quicker-cooking, less nutritious and more expensive foods adopted. The dietary implications of these developments are hard to quantify, but may be serious.

One of the earliest and most common expressions of fuelwood scarcity is the increased collection time necessary to provide a household's fuel. This has serious implications for the labour budget of the women responsible for fuel provision, impinging on the time available for other productive or household maintenance activities. The increase in time needed to gather fuel can be gradual and incremental, as existing sources are depleted. It can be a sudden and major change as the women have to exploit entirely new, more remote sources of supply. There is typically a break-point where fuel can no longer be gathered within the daily routine of other activities and much longer trips specifically for fuel gathering become necessary.

As biomass resources become scarce the other, non-fuel uses cited above can be cut back. This can affect other aspects of the production system detrimentally. For example, increased use of dung as a fuel can adversely affect soil fertility or over-exploitation of common woodland resources can jeopardise the availability of fodder or construction materials. As such, where resources are abundant the alternative uses of biomass materials produces no problems, but where scarcity emerges a series of conflicts between alternative needs can emerge. How these conflicts are resolved depends on who controls the resources and who benefits from the alternative uses.

Where wood availability becomes problematic, people may switch "downwards" to crop or animal residues (Barnard and Kristofersen 1985). These are often inferior fuels, but are usually more readily available. In many areas, such as Bangladesh and much of north India, residues have long been the dominant fuel. In these areas these is no fuelwood problem, as wood is far too valuable to burn. There are serious biomass energy problems, and the sort of resource conflicts outlined here are at their most acute in regions where residues have replaced wood as the main household fuel.

Alternatively, people may switch "upwards" to commercial fuels such as kerosene and LPG. This can occur through choice, and indeed is a good indicator of development. It can be through necessity, where people have no choice but to spend scarce cash on a basic need. The availability of commercial fuels is itself a problem for many areas; limiting people's scope for adopting this response to fuelwood stress. This is particularly true in rural areas, where commercial fuel supply systems are rarely well developed.

Where resource pressures exist woodfuel becomes commoditised - changing from being a free good to something which is bought and sold. Where this happens an already acute resource scarcity becomes far worse. The beneficiaries of commodification are the well-off (typically men) who control the land resources. The losers are the poor and the women, who find their already fragile access to wood resources eroded even further. In many cases they are the ones who have to pay for the fuel which they used to gather as a free good. As is so often the case, as fuelwood problems emerge it is the poor and disadvantaged who are hit first and hardest. In some cases, such as parts of Nepal and Bangladesh, agricultural residues are becoming commoditised; a clear indication of an extreme energy crisis.

Different aspects of the local fuel economy can change where pressures on biomass fuels becomes acute. Rights and responsibilities connected to needs provision and resource management can change to reflect emerging scarcities. This can take many forms. A common one is for men to begin to assist in fuel provision, either by helping to gather fuel or by providing alternative resources. Landless or land poor families may find traditional rights to collect fuel on the land of others are eroded (a particular problem where resources acquire commodity value). Traditional, sustainable management practices of communal land break down, depleting the resource base and resulting in the loss of the indigenous knowledge on which these practices are based. These and other changes are symptomatic of the erosion of the social fabric of local communities as existing systems of needs provision break down under the traumas of resource scarcity.

Finally, in the background of all of these responses is the actual or potential erosion of the land resource base as scarcity and conflicts between different uses and the needs of different groups is resolved temporarily by the extraction of biomass materials (not just wood - this can include fodder, manure and so on) at a rate greater than the capacity of the local environment to produce these materials. This reflects a conflict between immediate survival needs and the long-term maintenance of the resource base; a conflict of which local people are

well aware, but over which they have no choice. The result is, of course, environmental degradation.

The impact of fuelwood use on the environment is an issue which has excited a great deal of controversy. It is one of the most important issues which this policy review must address. We now turn to consider it in some detail.

7. FUELWOOD, DEFORESTATION AND LAND DEGRADATION

Much controversy has surrounded the question of the environmental impact of fuelwood use. It has often been cited as a factor which contributes to the mass decimation of tropical forests: a contention which is hard to support and for which no satisfactory evidence has been produced. At the other extreme, suggestions that the exploitation of wood for fuel has no adverse environmental consequences appears to be equally hard to support. There is little doubt that in some places fuelwood use does result in land degradation, but this is not invariably so even where resource scarcity does exist. In this section we discuss where and why environmental damage results from biomass fuel use.

Much of the international concern over tropical forests has centered on the loss of large tracts of natural forest areas, with the rain forests in particular attracting attention. This deforestation is indeed an issue which should concern us all, as it has global environmental implications. There are a number of studies which show that the extent of large-scale deforestation is greater than had previously been assumed. Recent figures in World Resources 1990-91 suggest that rain forest loss has accelerated through the 1980s, whilst preliminary results from the UNEP-GRID survey of tropical deforestation show that this is true for tropical forests in general. The causes of this deforestation vary, but are mainly associated with the drive to open up and exploit what is seen as one of the last great land frontiers. Commercial logging (Tyler 1990), clearance for large-scale ranching, in-migration following road construction or through government-sponsored transmigration schemes (Fearnside 1986, Monbiot 1989), flooding from giant HEP schemes and other development pressures are all widely cited as contributing to large-scale deforestation.

The exploitation of forests for fuelwood use contributes little to this process. This is especially true for fuelwood gathered to serve the needs of local rural communities; not a surprising conclusion, as where there are large tracts of forest there are few people. Commercial exploitation for urban fuelwood and charcoal markets does have an impact in some regions. Fearnside (1989) cites charcoal production for iron smelting in the Carajas region of Brazil as a threat to the forests of eastern Amazonia, a major study by the ODA (Bird and Shepherd 1988) has shown that the acacia woodlands of the Bay region of Somalia are being devastated by charcoal production for Mogadishu's markets, Bowonder et al (1987) detail the impact of urban fuelwood use around a number of Indian cities and Soussan et al (1990) provide further evidence from a number of sources.

This appears to be the main link between fuelwood use and large-scale deforestation. Rural fuelwood use is often cited as a factor, but these assertions are rarely substantiated with any real evidence. Indeed, the evidence points the other way: where the forests are opened up, land clearance leads to massive fuelwood surpluses and substantial quantities of wood resources are either burnt or left to rot. In such circumstances, talk of stress associated with the over-exploitation of forest resources for fuel use obscures the real causes of large-scale deforestation.

Fuelwood use, both for local needs and external markets, does have other environmental implications. There is considerable evidence to suggest that land resources in agricultural areas can experience degradation associated with their over-exploitation for fuel use. This problem is particularly associated with the degradation of the small areas of woodland found scattered within agricultural landscapes. Most farming areas have woods on steeper hillsides, along river courses, on marshy ground or areas of poorer soils and in other niches not used for farming. They are usually communally owned and managed (although the state may have nominal proprietorial rights).

These woodland resources are an integral part of the rural economy, and provide a range of products. Peasant farming systems are based on the use of both private and communal land resources to produce goods for both markets and subsistence consumption. Growing populations, increasing commercialisation of rural economies and other incentives to clear more land have led to the incremental colonisation of these resources for cultivation. This leaves a smaller area to serve growing needs for fuel and other products (especially fodder, which reflects increasing livestock numbers), which in turn results in the over-exploitation of their biomass resources.

These remaining communal areas lose their species diversity, have declining stocks and show little sign of regeneration. They consequently become more vulnerable to environmental hazards such as drought or soil erosion. The erosion of communal resources leads to an increasing reliance on externally-produced commercial goods, which in turn depends on greater cash income. This leads to the further erosion of communal goods as they are exploited for private commercial gain.

As such, fuelwood use is certainly a contributory factor to the degradation of land resources in agricultural regions where more general resource pressures are felt. This form of degradation is far from universal; indeed in most rural areas fuelwood gathering for local use has only a marginal, if any, impact on land resource quality.

It is a problem precisely where the rural economy and environment is most vulnerable; in localities where the resource base is already under threat and where the community has the least resources to counter this threat. Many case studies illustrate this form of environmental stress. Saxena (1987), Moench (1989) and Singh et al (1984) give examples from the foothills of the Himalayas, Christiansson (1988) evidence from Tanzania and Johnson and Tomkins (1989) illustrate the pressures on Swazi Nation lands in Swaziland. In more comprehensive studies, Smil (1983) cites local fuelwood use as a contributory factor to land degradation in China and Ryan (1990b) presents a preliminary analysis which links the degradation of woodland resources in many parts of India to the pressures of growing fuel demand.

As such, where local fuelwood use does contribute to land resource degradation, it is not the sole, or even the main, cause of this stress. Fuelwood use contributes to this degradation because it is an integral part of the rural economy/environment relationship, and it is the general pattern of rural development in poor, environmentally vulnerable areas which creates stress, not fuelwood use alone.

8. CONCLUSIONS

This paper has presented an analytical framework through which it is hoped a more complete understanding of the origins and manifestations of fuelwood production and use in any one particular setting can be achieved. In this, the trick is not to try to analyse fuelwood uses and stresses solely through the direct and measurable at one point in time. The direction and speed of change in fuelwood production and use patterns and the relationship of these patterns to the wider development of the local production system should be seen as the starting points of analysis.

This type of analysis can only really be understood if the perceptions and priorities of the people on the ground are sought; a process which is in itself desirable and which can form the starting point of their wider participation in the creation of solutions to the problems they reveal. The adoption of such an approach is not in itself a complete answer to the problems surrounding the creation of effective fuelwood projects on the ground but it will produce an orientation (as much as anything, a way of thinking) which is the first step to building such solutions.

9. REFERENCES

AGARWAL, B. (1986) Cold hearths and barren slopes Zed Press, London.

ARMITAGE, J. & SCHRAMM, G. (1989) "Managing the supply and demand for fuelwood in Africa" in Schramm, G. & Warford, J. (Eds 1989) Environmental management and economic development John Hopkins Press, Baltimore, pages 139-171.

BARNARD, G. & KRISTOFERSEN, L. (1985) Agricultural residues as fuel in the Third World Earthscan, London.

BIRD, N. & SHEPHERD, G. (1988) Charcoal in Somalia ODA, London.

BOWONDER, B. et al (1987) "Deforestation around urban centres in India" Environmental Conservation vol. 14, no. 1, pages 23-28

BRISCOE, J. (1979) "Energy use and social structure in a Bangladesh village" Population and Development Review vol. 5, no. 4.

ETC (1987) SADCC fuelwood study ETC Foundation, Leusden, The Netherlands.

ECKHOLM, E. et al (1984) Fuelwood: the energy crisis that won't go away Earthscan, London.

FEARNSIDE, P. (1989) "The charcoal of Carajas: a threat to the forests of Brazil's eastern Amazon Region" Ambio vol XVIII, no. 2, pages 141-143.

FLOOR, W. (1987) Household energy in West Africa mimeograph, ESMAP, World Bank, Washington DC.

GEORGE, S. (1988) A fate worse than debt Penguin Books, Harmandsworth.

JOHNSON, V. & TOMKINS, R. (1989) "Fuelwood scarcity in Swaziland" International Journal of Ambient Energy vol. 10, no. 2, pages 59-102.

LEACH, G. & MEARNS, R. (1988) Beyond the woodfuel crisis: people, trees and land in Africa Earthscan, London.

MERCER, D.E. & SOUSSAN, J. (1992) "Fuelwood and forestry policy in Developing Countries" in Sharma, N.P. (Ed) (1992) Managing the World's Forests Kendall/Hunt Publishing Co., Dubuque, Indiana.

MOENCH, M. (1989) "Forest degradation and the structure of biomass utilization in a Himalayan foothills village" Environmental Conservation vol. 16, no. 2, pages 137-146.

MONBIOT, G. (1989) "The transmigration fiasco" Geographical Magazine May 1989, pages 26-30.

MUNSLOW, B. et al (1988) The fuelwood trap Earthscan, London.

PEARCE, D. et al (1989) Blueprint for a green economy Earthscan, London,

REDCLIFT, M. (1987) Sustainable development: exploring the contradictions Methuen, London.

RYAN, P. (1990a) "ESMAP: woodfuels development strategy" mimeograph, ESMAP, World Bank, Washington DC.

RYAN, P. (1990b) "India: woodfuel supply situation" mimeograph, ESMAP, World Bank, Washington DC.

SAXENA, N. (1987) Commons, trees and the poor in the Uttar Pradesh hills ODI Social Forestry Network, Paper 5f.

SINGH, J. et al (1984) "Man and forests: a central Himalayan case study" Ambio vol XIII, no. 2, pages 80 87.

SMIL, V. "Deforestation in China" Ambio vol. XII, no. 5, pages 226-231.

SOUSSAN, J. (1988) Primary resources and energy in the Third World Routledge, London.

SOUSSAN, J. (1990) Common issues and processes in African energy policy The Netherlands Ministry of Foreign Affairs, Directorate General for International Cooperation, The Hague.

SOUSSAN, J. et al (1984) Fuelwood strategies and action programmes in Asia AIT, Bangkok.

SOUSSAN, J. et al (1990) "Urban fuelwood: challenges and dilemmas" Energy Policy, July/August 1990.

SOUSSAN, J. et al (1991) "Planning for sustainability: access to fuelwood in Dhanusha District, Nepal" World Development, vol. 19, no. 10, pages 1299-1314.

SOUSSAN, J. et al (1992a) "Fuelwood policies for the 1990s" Energy Policy February 1992, pages 137-144.

SOUSSAN, J. et al (1992b) "Finding local answers to fuelwood problems: Natural Resources Forum May 1992, pages 91-101.

TYLER, C. (1990) "The sense of sustainability" Geographical Magazine February 1990, pages 8-13.

WORLD RESOURCES INSTITUTE (1990) World Resources 1990-91 World Resources Institute, Washington DC.

Audio-Visual Presentation: Woodfuel Supply and Use System in Cebu City, Philippines

by

E. Remedio and T. Bensel[1]

1) The island province of Cebu is located in the Central Visayan region of the Philippines. The island is long and narrow, stretching 220 kilometers north to south and only 40 kilometers in breadth at its widest point.

2) The metro Cebu area, consisting of Cebu, Mandaue and Lapulapu Cities, as well as nearby municipalities, is the second largest urban area in the country and serves as the center for commerce and government in the Southern Philippines.

3) Downtown Cebu City is located along the narrow coastal plain that rings the island, however, 85% of the city's land area consists of rugged mountain terrain.

4) City dwellers can view these mountains daily but few have ventured into them since until now only the lowlands have really been developed.

5) The city has grown up around its port which is well-protected from storms by nearby Mactan Island.

6) Today, Cebu International Port serves as a gateway for vessels sailing into and out of the region.

7) The port area handles large volumes of domestic passenger and cargo boats.....

8) As well as international container vessels carrying goods into and out of the country.

9) In fact, it was the excellent protection of Cebu's Harbor that attracted the explorer Ferdinand Magellan to these parts in the year 1521.

10) It was on the shores of Cebu that Magellan met his death, but his influence and that of the Spanish colonizers that followed, remains until today and can be seen in a number of things including.....

11) Historical sites and architecture, the language, the culture, food and dress.

12) Perhaps the most enduring legacy of the Spanish - era is the dominance of Catholicism throughout the Philippine archipelago. As of 1990, over 95% of Cebuanos were Catholic.

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[1] USC - Philippines and UNH - U.S.A.

13) The Cebu of today is not only home to an international shipping port, but also an international airport handling both overseas flights.....

14) As well as domestic.

15) The city of Cebu is home to the Provincial Capitol and to national government offices serving much of the southern part of the country.

16) Metro Cebu is also the regional center for banking, insurance, commerce, education and manufacturing.

17) One of the growing number of export processing zones in the Philippines is located here.

18) Products produced in the EPZ and by other manufacturers range from native handicrafts to textiles, electronics, food products, rattan furniture, stonecraft and woodcraft, fashion accessories and activated carbon.

19) Cebu is also a major tourist destination with its fine beaches, golf courses and historic sites.

20) With the old downtown area fully built-up and congested, developers have begun looking for new places to build.

21) A number of projects are underway to reclaim vast stretches of nearshore marshlands and.....

22) Convert these into industrial, commercial and residential areas.

23) The city is undergoing a building boom that is transforming the skyline.....

24) And forcing the government to accommodate this development with improved roads and other infra-structure.

25) Perhaps less than 5% of the city's population lives in upper class luxury such as this area known as Beverly Hills.

26) A much larger percentage make up the middle class living in simple, but comfortable houses and apartments.

27) And despite all the development, a large number of Cebu's residents still live in squalid conditions such as this.

28) The mainstay of the rural Cebuano is the cultivation of corn, which is usually grown in rained plots for two cropping seasons a year.

29) Many of Cebu's farmers are tenant-cultivators, and they grow corn on even the steepest slopes using the most basic techniques.

30) Such a practice often results in severe erosion such as that seen on this hillside. Scenes such as this, combined with the fact that the island is 99.6% deforested, has led many officials and urban dwellers to predict that the island's environment is on the brink of collapse unless drastic actions are taken. Widespread woodfuel use is often one of the reasons given for this perceived state of affairs.

31) ;Coconut plantations also cover large portions of the island. Coconuts provide cash income as well as providing cooking fuel from its fronds.

32) In some of the long-settled interior plains of the island, farmers use indigenous and introduced agroforestry techniques to produce a range of products, such as corn for own consumption, vegetables and fruits for market sale, and bamboo for a variety of uses.

33) Even on steep slopes, farmers with secure tenure, adequate water and access to markets will develop the lands to produce high value cash crops such as cut flowers and mangoes.

34) In the past, much of the woodfuel needs of the island were met by trees growing in native shrub forests such as that seen in this picture.

35) These forests contain a variety of shrub and secondary growth species, including valuable hardwood species such as molave or vitex parviflora. If given time, these shrub forests regenerate well after cutting.

36) Today, however, the area covered by shrub forests is declining and perhaps 80 to 90% of the commercially traded woodfuels in the province are originating from well-managed lands such as this farm where giant ipil-ipil is being grown as a boundary marker and Gliricidia sepium is being grown as tree fallow.

37) Propagation of Gliricidia sepium as a tree fallow is common in a number of areas after corn cultivation has exhausted the soil. This species grows well even on this soils, it coppices well, fixes nitrogen, and provides good forage and ground cover.

38) Here it is covering idle lands above the point where water is available for intensive cultivation of vegetables and cut flowers. This area is less than 10 kilometers from downtown Cebu City.

39) Some landowners have even converted their lands into dedicated woodfuel plantations.

40) This 6 hectare plot is located in Compostela, 25 kilometers from Cebu City. In the 1970s the land was taken out of corn cultivation and planted in giant ipil-ipil, cacao and a variety of fruit trees.

41) Today, the six-hectare plot is harvested every one to two years by groups of families in the area. The straight trees are left to grow for five years and then cut for underground mine props. The families doing the cutting share the income with the land-owner, with either 1/2 or 2/3 of the returns going to the cutters, depending on the arrangement.

42) Although not quite a woodfuel plantation, large areas of the hillylands within 30 kilometers of the city are covered with Gliricidia sepium and a so - called native ipil-ipil or Leucaena glauca.

43) This whole mountainside has been planted in Gliricidia sepium for over 30 years after corn cultivation became too difficult. Located only 15 kilometers from the city, many of the residents in this place hole jobs in factories and find the harvesting of wood and making of charcoal a convenient and flexible source of supplemental income.

44) In some places, species such as Gliricidia sepium grow densely side by side with fruit and secondary forest species.

45) In addition to the fast-growing species and native shrub species, another important source of woodfuels is fruit trees. Cebu's central hilly-lands hold large numbers of mango, star apple, jackfruit and tamarind.

46) In November 1990, the province was struck by a super-typhoon dubbed Ruping which uprooted large numbers of fruit trees. Nearly two years after the storm, some fallen trees were still being turned into charcoal or, as seen here, into log bolts for the production of wooden packing crates.

47) Most of the patches of Gliricidia sepium, Leucaena leuceophalla and glauca are coppiced on a 1 1/2 to 2 year cycle. These trees coppice extremely well, and regenerate rapidly as can be seen in this picture taken only three weeks after harvest.

48) It is common to divide a plot into three or four areas and harvest these on a rotating basis every 6 to 8 months. Trees cut on this hillside are being converted into charcoal in the lower left - hand portion of the clearing. In six months, this portion will be cut.

49) It is also common to grow one crop of corn in between newly - coppiced trees as can be seen on this hillside. The new shoots of the trees are cut back until the corn grows tall enough to compete for sunlight.

50) The cutting of trees is done with simple implements like this machete. Wood-cutters working on others lands will either pay the landowner a fixed amount for the trees or share the income from the cutting with the landowner.

51) After harvesting, some wood-cutters move the poles to another place, usually near the road.

52) At that point the poles are sized and split.....

53) And then bundled to await pick-up and delivery.

54) Other wood cutters will do all of the sizing and splitting of wood at the point where the trees are cut and then carry the split wood to the roadside for re-bundling into smaller units.

55) Typically, fuelwood is simply left to air-dry for a few days time.

56) But species such as Gliricidia sepium are susceptible to infestation by wood - eating weevils, which Cebuanos call bok-bok.

57) As a result, some ingenious wood cutters have begun to "smoke" freshly cut wood which speeds up drying and deters infestation.

58) Most charcoal making is done using pit kilns dug from the earth.

59) Some charcoal makes prefer to build their kilns near to the site where the wood is cut since it is easier to transport the finished charcoal than freshly cut wood.

60) Other charcoal makes prefer to have the kiln near to their house so that they can easily monitor the charcoaling process.

61) Once ready, woodfuels are usually brought to a drop-off point. Most hauling is done manually, here sacks of charcoal are tied to a bamboo shoulder pole for easier hauling.

62) Here, young children accompanying their mother to a health clinic are carrying bundles of firewood prepared by their father, some 2 kilometers to a drop-off point.

63) Occassionally, animals such as water buffaloes and horses are also used.

64) The system of roadside drop-off points is an interesting one and is well-established in most areas.

65) Different fuelwood cutters and charcoal makers have specific points along the road where they can leave their stocks and then go to the trader and request payment.

66) Sometimes, stocks will be left for days before being picked up, but we rarely encountered any complaints of theft or missing bundles.

67) In some cases, woodfuels are carried directly to the traders house, especially, as in this case, if the trader happens to own his own vehicle.

68) There is a clear distinction in types of bundles. This type of bundle consisting of well - split, dried pieces with the bark removed is called raja, and is usually sold to households or smaller commercial users.

69) This type of bundle is called ucay-ucay and consists of freshly cut unsplit logs with the bark intact. Ukay-ukay is usually sold to larger commercial and industrial users.

70) Once enough wood or charcoal is ready to fill a truck it is loaded onto the conveyance.

71) A variety of vehicle-types are used depending on distance. Wood fuels coming from longer distances are usually carried in larger trucks like this one.

72) Supplies coming from nearby mountain barangays are often carried on the roofs of passenger jeeps.

73) Some of the more successful traders own their own vehicles.

74) But usually, vehicles are hired and transport costs can often account for as much as 20 to 30% of the final selling price of woodfuels.

75) Before reaching the city it is possible that the load will have to pass through a DENR checkpoint. This is the only permanent checkpoint in the province but the DENR also fields roving check-points at various entry points to the city. Notice the confiscated logs and fuelwood in the foreground.

76) If caught conveying wood without a permit, or conveying illegal species, then the DENR can confiscate both the cargo and the vehicle and dispose of these through public bidding. This bus was caught transporting wood and charcoal without a permit.

77) Larger commercial users such as bakeries, or noodle factories will usually get their supplies delivered directly from the province.

78) Others obtain their supplies from any number of urban traders located throughout the city. The larger urban traders, such as this one, will stock a variety of fuels such as well-split bundles for households, bundles of logs for bakeries, and bundles of coconut fronds for poso makers and eateries.

79) Traders selling mainly to commercial users will usually only stock logs and unsplit portions of felled trees.

80) While those selling mainly to households will stock neater bundles of wood and coconut fronds.

81) Very few traders practice break of bulk with regards to fuelwood unless, like this one, they are located in very low-income neighborhoods where wood and even bamboo are rebundled into smaller, more affordable units.

82) Larger bundles of bamboo, coconut fronds, and lumber off-cuts are also available, mainly for use by commercial establishments.

83) With all the construction in Cebu there is plenty of scrap wood available.

84) Much of this is hauled to a so - called scrap - wood factory in a vacant lot of a squatter community. There, the scrap wood is sized, split and bundled and sold to household and commercial users.

85) Sawdust from lumber yards is used in what is called a san-san stove. The sawdust is tightly packed into the drum and then a small amount of burning wood is placed at the bottom and the sawdust begins to burn from within. One stove like this will use only a few pesos of sawdust and burn continuously for 8 to 10 hours making this fuel popular for street food vendors.

86) Larger charcoal dealers usually sell be the sack to households, restaurants and bakeries. They also sell sacks to smaller stores and vendors for re-packing.

87) The charcoal is repacked into cellophane bags usually weighing less than one kilogram.

88) These bags are then either sold from stores or by roving vendors using what is known as a trisikad.

89) The urban traders were a great source of information on a number of aspects of the commercial woodfuel system.

90) Some of these traders have been selling woodfuels for over 30 years and were able to provide us with a wealth of historical data on prices, species, and end-uses of commercially - traded woodfuels.

91) In addition to oral responses, direct weighing of woodfuels sold by over 50 urban traders were made in order to collect accurate current price data. Other features of fuelwood and charcoal being traded were also recorded.

92) An effort was made to account for all expenses encountered by urban traders in order to determine the competitiveness of the trade. These expenses include the common ones of labor and material as well as uncommon ones like theft and wastage, as seen in this picture.

93) A variety of means are used to move woodfuels within the city such as pushcarts.....

94) Human - powered trisikads.....

95) And motorcycles with sidecars. All these modes provide indirect income and employment to a number of urban - dwellers.

96) Woodfuels are used by households in a variety of purchased and improvised wood - pruning stoves.

97) Street food vendors account for perhaps as much as 15 to 20% of all woodfuel consumption in the city.

98) Many such vendors prefer to make use of coconut fronds, bamboo or coconut logs since these are generally 20 to 30% cheaper on a per unit basis than regular fuelwood.

99) This steamed rice cake maker uses bamboo logs for reasons of cost and because this fuel burns fast and hot, important in maintaining the steam.

100) The making of poso, or rice cooked in woven coconut leaves, is also a major consumer of woodfuels.

101) Usually the poso is cooked in large 55 gallon drums, in this case with the use of scrap wood (left) and coconut lumber off-cuts (right).

102) Bakeries consume about 10% of traded fuelwood in their huge ovens. They also account for a smaller percentage of charcoal consumption.

103) A variety of other food processors also consume woodfuels such as in this noodle factory.

104) Even large scale industrial users such as manufacturers of carrageenan, insect repellents and rattan furniture make use of a variety of woodfuels.

105) Rattan furniture factories use woodfuels to produce steam for drums where rattan poles are placed for 30 to 40 minutes. When removed, these poles are ready for bending and shaping.

106) Many of these factories generate enough wood wastes to meet their needs, but scores of smaller producers have to supplement their scrap with purchases of fuelwood from the mountains.

107) Slightly over half of all traded charcoal is consumed in households for ironing, cooking, barbecuing and occasional pig roasting for special occasions.

108) Another 5 to 10% is used by commercial dealers of roasted pig, usually on Saturdays and Sundays when sales are best.

109) And as much as 40% of all the charcoal consumed in the city is for approximately 4,000 small-scale barbecue vendors such as this one who sell roasted pork, chicken and fish to a range of customers.

110) Predicting the sustainability of Cebu's commercial woodfuel industry is difficult. Rapid changes are taking place in rural areas such as the construction of this highway through the heart of Central Cebu's hillylands.

111) Such roads are often touted as being farm-to-market gateways but they appear more successful in opening up large tracts of rural real estate to housing developers.

112) A variety of tourist facilities are also being built or planned for a number of areas in Cebu's uplands.

113) Another significant land-use change is the expansion of poultry farms, especially in Consolacion, Lilo-an and Compostela, three significant woodfuel producing areas.

114) Land clearance for poultry farms or for housing produces a pulse of woodfuels, such as these logs.....

115) Or these roots which will be converted to charcoal. But these are unsustainable supplies, clearly different from the practice of coppicing trees and leaving the roots and trunk intact to regenerate.

116) As mentioned a number of times, coconut fronds are an extremely important biofuel in Cebu.

117) This biofuel accounts for as much as 30 to 40% of all commercially traded biofuels in the urban areas and meets the subsistence biofuel needs of perhaps as much as 80% of the islands rural residents.

118) However, large numbers of coconut trees are being cut due to over-maturity and declining prices for copra.

119) Another incentive to cut is that good prices can be had for coconut lumber.

120) Government and NGO reforestation efforts are tending to focus on high-value trees such as this mahogany. Sometimes, areas covered in woodfuel shrub species are cleared to make way for these reforestation programmes.

121) Some of these trees will be left to grow for 15 years, others cut after 5 to 10 years for underground mine props.

122) To our knowledge, there are only 2 government reforestation projects that have any direct woodfuel component.

123) Our observations suggest that these programmes will not be as successful as private plantations such as this one, or be competitive with woodfuels produced by farmer's on idle lands or around the agricultural landscape.

124) Given the common perception of many people that Cebu is on the brink of environmental collapse, we must admit some surprise in finding the current woodfuel system to be highly sustainable in nature. Despite rapid changes in rural areas, it appears highly probable that the commercial woodfuel system of Cebu will continue to be a sustainable source of energy to many urban users and income to rural growers, harvesters and traders.

Energy Policies and the Utilization of Wood Fuels

by

Conrado Heruela[1]

"Topical Outline of Presentation"[2]

Objective: To examine how energy policies have made an impact on the supply and utilization of wood fuels.

1. General patterns in the utilization of wood fuels in the region:

   - percentage share in the country's energy supply decreasing because of the following factors:
     - population growth
     - urbanization
     - increasing family income
     - increasing availability of affordable, accessible, convenient and clean commercial fuels

   - however, total absolute volume of use is increasing because of;
     - increasing population
     - lack or inadequate access to commercial fuels, particularly in rural areas

   * wood fuels still remain as the largest of component of the energy supply mix

2. Before oil crisis of the 1970s, what determined energy supply mix:

   - basically, market forces

     - decisions mainly done by oil companies and power utilities on the basis of projected market demand
     - prices

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[1] Wood Energy Planning Consultant - Regional Wood Energy Development Programme for Asia

[2] The materials used for this presentation were obtained mostly from the *Integrated Energy Planning: A Manual - 3 Volumes (1985)*, a publication by the Asia Pacific Development Centre, Kuala Lumpur, Malaysia

3. After oil crisis:

- emergence of energy policies
    - national plans
    - energy development programmes
    - various energy projects
    - taxes/subsidies

4. Thinkings that shaped up energy policies (up to mid-1980s)

- oil reserved will rapidly diminished towards the early part of the next century
- rapid escalation of oil prices - projected values of us$40-60 a barrel by mid-1980s
- economic expansion will continue in most part of the world - putting preasure on energy supply
- increasing industrialization, urbanization and family income in many of the developing countries - further increase world demand for energy supply

5. Other factors which influenced energy policies:

- new and renewable sources of energy can be developed and be made to substitute conventional and commercial fuels
- too much optimism and failure to consider many non-technical aspects of technology development and dissemination
- use of traditional sources of energy, particularly firewood, is leading to deforestation -lack of adequate reliable data in the past and oversimplication of the dynamics of wood fuels supply use and demand

6. General energy supply policies adopted by countries in the region:

- minimization of use of imported fossil fuels
- fuel substitution by shifting to non-petroleum fuels, mainly coal,hydro and nuclear
- development of alternatives such as solar, wind,"modern" biomass and geothermal

7. Energy demand management strategies initiated:

- conservation programs
    - information dissemination
    - extension services
    - research and development
    - training
    - incentives (fiscal/financial policies)

- taxes/ subsidies - basically the price mechanism

8. Policy Issues in the Energy Sector

* status of this policies

* state of understanding of the bases of these policies given the developments after mid-1980s:
  - dynamics of world oil price and supply
  - expansion of many economies in developing world
  - increasing concern for the environment
  - increasing understanding of the significant contribution of fossil fuel-based systems towards global warming
  - socio-demographic trends in developing countries, e.G., Urban and rural population trends, family incomes
  - highly decentralized nature of wood energy systems and other renewables
  - recent developments in technology improvements and attempts in technology dessimanation of renewables
  - new evidences on the potential of renewable energy systems, particularly the sustainability of use of wood fuels in the domestic, commercial and industrial sectors
  - the site-specific character of wood energy systems which is complex and diverse in nature will require innovative institutional structures for planning and program implementation
  - limited supply of capital investment fund needed for expansion of energy projects, particularly power development projects

* potential for policy change given:
  - state of awareness and understanding
    - adequacy an reliability of data and information
    - present biases in:
      - methodologies for project appraissal and for making decisions in investments and budgetary allocations
      - institutional structures which are
        - higly centralized
        - dominated with knowledge in conventional energy
        - lack or weak grassroot linkages

Forestry Policies and Woodfuels in India
Problems and Prospects

by

N.C. Saxena[1]

1. FUELWOOD IN RURAL AND URBAN INDIA

In most of the rural areas of the Third World, fuelwood[1] is the primary source of fuel for domestic cooking. In India too, although the use of dung and agricultural waste as fuel is widespread in agriculturally prosperous regions with fertile soils and controlled irrigation, wood continues to be the main domestic fuel in less endowed and poorer regions. Between 90 and 95 per cent of the total domestic fuel consumed in rural areas in India is made up of fuelwood, agricultural wastes and animal dung, of which the share of fuelwood is 65 per cent (Natrajan and Sundar 1985).

In urban areas, on the other hand, the energy use patterns are changing with greater use of LPG and kerosene (Natrajan 1990). Between 1978/79 and 1983/84 fuelwood consumption dropped in India by an average of 40 per cent in the urban areas, but kerosene consumption rose by approximately 57 per cent and LPG consumption increased by 98 per cent. The extent to which this trend will continue is uncertain, and will depend to a large extent on government policies as regards the supply and pricing of kerosene and LPG. It is unlikely that fuelwood will be completely replaced, as poorer sections of the community may lack the cash resources to purchase the minimum amount of kerosene or LPG, or the appliances for these fuels. They may also lack the security to keep such fuels or appliances while absent from their living quarters, so that such persons may be forced to purchase more expensive small quantities of fuelwood regularly, perhaps daily, and use cheaper and less efficient cooking appliances.

Gathering for Consumption and Sale

Fuelwood is generally gathered by the rural people and even by the urban poor, and only the lower middle class in urban areas and the very rich in rural areas buy fuelwood. By one estimate, only 15 per cent of total firewood consumed in rural India is purchased, the rest being collected from public or own land. The share of each source of supply of fuelwood at the consuming point is shown in Table 1.

[1] Society for Promotion of Wastelands Development (SPWD), New Delhi, India

Table 1: Sources of Supply of Firewood in India in 1978-79
(million tonnes a year)

	Rural			Urban			Grand Total
	logs	twigs	total	logs	twigs	total	
Collected from							
i. own land	5.2	9.1	14.3	---	----	---	14.3
ii. neighbour's land	0.3	3.0	3.3	---	----	---	3.3
iii. forest land	4.6	18.9	23.5	---	----	---	23.5
iv. roadsides, etc.	1.3	24.4	25.7	0.4	1.6	2.0	27.7
Total collected	11.4	55.4	66.8	0.4	1.6	2.0	68.8
Purchased	8.7	3.3	12.0	11.1	2.6	13.7	25.7
Total	20.1	58.7	78.8	11.5	4.2	15.7	94.5

(Leach, 1987:43)

Thus firewood has been and still continues to be by and large a non-monetized commodity.

Even when firewood is traded, studies show that rural wood markets are small, localised, lack capital and hence buying capacity (FAO 1987; Saxena 1992). Fuelwood is supplied to these markets generally by poor gatherers, called headloaders, who have taken to this profession in the absence of other meaningful occupations.

A study (Agarwal and Narain, 1985:189) of 170 households in nine villages of district Ranchi (Bihar) showed that headloading had emerged as an important profession in the previous 15 years; and more than a fifth of the households in the surveyed villages reported headloading as their major occupation. Another study (Agarwal, 1987:181) estimated that at least 3 to 4 million people were involved in this profession, making it India's biggest source of employment in the energy sector. In Rajasthan alone 400,000 families are reported (NWDB, 1988: 15) to be engaged in extraction of firewood from forests. From Madhya Pradesh forests 6 million tons of firewood are taken out every year for sale in towns and cities (exclusive of wood collected for domestic use). It is a low paid and a high risk occupation, as pilfering wood from reserved forests for sale is an offence (collecting wood for self consumption from protected forests is permitted on paper, but frowned upon by the forest staff in actual practice). The study commented that it was ironic that tribals, who for centuries lived in harmony with forests, were today forced to eke out a living by further destroying their forests.

2. FUELWOOD GATHERING AND DEFORESTATION

This brings us to the general question of causes of deforestation. The relative contribution of the two categories of consumers, people and industry, has been a subject of controversy in India, which has blurred its objective analysis. As commercial and industrial requirements is low as a proportion of the total demand for wood, at less than 20 per cent (World Bank 1988: 26), several foresters think that peoples' demands put an unbearable burden on forests. The Principal CCF Karnataka estimated (Shyam Sunder and Parameshwarappa 1987: 2023) that the deficit faced by the pulp industry in Karnataka in 1985 was 0.2 million tons per annum, whereas the firewood deficit was more than 4 million tons. And therefore the

responsibility for deforestation should also be borne largely by the people, and not by industry. Clearing for agriculture, particularly in tribal areas, resettlement, heavy grazing and fodder collection, all done by rural people, play an important role in destruction and degradation of the forest cover. The almost continual lopping for fuelwood and/or fodder as well as cattle and goat browsing, that occurs in many areas and prevents adequate regeneration, must play a major role in forest destruction.

On the other hand, a study done by a voluntary agency (PRIA, 1984: 35) showed that one-third of rapid deforestation in Himachal Pradesh was due to excessive exploitation by the forest-dwellers, and the rest due to commercial interests. It also observed that forest dwellers' over-exploitation is a recent phenomenon, caused by two factors. First, increasing marginalisation of small land owners has forced them to seek new avenues of income, like head-loading and second, the indiscriminate tree felling by the contractor-official-politician nexus has had a corrupting influence on the forest dwellers, who also wish to `make hay while the sun shines'. Another study (Reddy, 1987) found that degradation of forests was caused by demand from both wood-based industries and fuelwood-collecting households living close to forests.

Another group of people (Bowonder *et al.* 1986; Bowonder, Prasad and Unni 1985, Bowonder 1983; Economic Intelligence Service 1982) make a distinction between use of fuelwood by rural people, which is largely twigs and branches and hence sustainable, and by urban sector. According to them, there is a need to differentiate between urban and rural demand patterns and their respective effect on wood fuel supplies, as well as on the chances for interfuel substitution. Not only are urban wood fuels usually traded, thus having a much wider effect on the supply scene than village fuelwood demand, but the greater use of logs and larger branches means that reasonably-sized trees are sought after and cut, possibly in large patches thus having a more degrading effect on the forest than may be the case with village supplies that can be obtained more often from pruning or pollarding branches of trees or even bushes in a limited area. Thus collection of fuelwood and the manufacture of charcoal for sale in urban areas is the cause of much destruction and degradation of forests.

Clark and Shrestha (1989) agree that it is not possible to determine to what extent each of the above factors causes deforestation, but, they argue, that deforestation can occur through excessive depletion of young trees by households with even a limited demand for fuelwood under open access forest exploitation. The author's own field work supports this. Deforestation has often been associated with sudden policy change or periods of uncertainty, like takeover of private forests, abolition of landlordism, setting up of Forest Corporations etc, political unrest leading up to elections, etc. Once large trees are felled, the old harmony between people's demands and supplies through twigs and branches gets disrupted, and department's efforts towards replanting come to naught. Thus deforestation, rather than being a continuous phenomenon, could be interpreted as a one-shot operation often directed by governmental activity. As these examples indicate, local patterns of deforestation vary and it is `never a simple matter of numbers outstripping environment' (Westoby, 1985). It occurs as a result of not just local pressures on resources, but also 'any momentary disruption of the institutional framework responsible for resource protection and management'.

3. FOREST POLICY UPTO 1975 AND FUELWOOD

Bulk of fuelwood is used and traded by people in the informal sector, especially in poorer regions. These category of people lack political clout, in contrast to urban areas and commercialised fertile rural regions, who have much better voice in the political system. This could be one reason why woodfuel issues were not seriously addressed by the policy makers till at least the middle of 1970s. Forest policy remained obsessed with timber, as described below.

4. HISTORICAL BAKCGROUND

When the British came to India, more than half of the total land was lying uncultivated. While they settled uncultivated lands close to habitation as village lands to be used for grazing and supply of subsistence goods, lands removed from habitation came under government ownership and declared as forest lands, where all rights of the people, except those specifically mentioned, were extinguished. These lands were then sought to be used to produce valuable timber for industries, railways, markets, export, and for meeting war needs.

With the passage of time forests no longer remained uninhabited wilderness. In addition to usual reason of growth in population, people were often brought by the Forest Department and settled in the forests to ensure continuity in the supply of labour. Today there are about 48 million forest dwellers in the country living within or in the vicinity of forests for whom forests have been an important source of their livelihoods and means of survival.

Despite legal restriction on the rights of the people to enter forests, forest lands continued to provide subsistence oriented goods to the people, and with adequate supplies from forests, it was possible to satisfy the market demand as well as meet peoples' demand. Forests at that time contained indigenous species, like sal (*Shorea robusta*), mahua (*Madhuca indica*), tamarind (*Tamarindus indica*), Acacia spp. and bamboo, which provided a great deal of what are misleadingly termed "minor" forest products (MFPs), which include many forms of food, including nuts, wild fruits, honey, and oilseeds; leaves, gums, waxes, dyes and resins; and raw materials like bamboo, canes and bhabbar grass for artisan based activities of the poor. Most forests are located in regions of poor soil, where agriculture is not very productive, hence forests are the source of a major portion of income through sale of fuelwood, called headloading, already described above.

5. BREAKDOWN OF HARMONY

As opposed to forest lands, village lands have been a victim of the "tragedy of the commons" phenomenon where exploitation is by all, but no one considers himself responsible for protection and maintenance. A *laissez faire* policy was followed by the government with respect to these lands. There was neither any fund allocation for them, nor was any specific government department made responsible for grasses and pasture development. A part of the village lands came under cultivation and the rest became too degraded for supporting vegetation. As these lands could not meet peoples' needs biotic pressure on forests increased, the old harmony between the needs of the market and exploitation by the people broke down, leading to rapid deforestation.

Till the mid-seventies the response of the government to this crisis of deforestation was to bring more forest lands under non-browsable and non-MFP trees in order to reduce biotic pressure and increase state revenues. Even in those areas where biotic pressure was low, market-oriented timber species were planted because of the general policy in favour of such species. Scientific forestry in India has meant raising trees in order to get sustained yield of timber for markets in perpetuity. Right from the First Plan in 1952, emphasis was laid on the conversion of "low" value mixed forests into "high" value plantations of commercial species like teak, eucalyptus and bamboo. As late as 1976, a high powered government commission, called the National Commission on Agriculture (NCA) recommended, `Production of industrial wood would have to be the raison d'etre for the existence of forests. It should be project-oriented and commercially feasible from the point of view of cost and return'.

Impact on Fuelwood Prices

This deprived millions of poor of the livelihood goods that they used to get from mixed forests. Neglect of people's demands during 1960-80 exacerbated biotic pressure which made regeneration of natural forests further difficult. The ratio of firewood to foodgrain price doubled in 1975-85 (see Table 2) which made cutting wood for sale an attractive economic activity.

Table 2: Retail Price of Firewood in Rural India

Year	All India Average Retail Price of Firewood (Rs./Quital)	All India Wholesale Price Index (1970-71=100)	Firewood Prices at Constant (1970-71) Prices (2) x 100/3
1973	9.1	140	6.5
1978	18.2	185	9.8
1985	43.8	350	12.5

(UNDP, 1986: 113)

According to Leach (1987), the real price of fuelwood increased by 34 per cent in 10 major cities of India during 1970-82, but another study of 41 towns showed 50 per cent increase during 1977-86 (Bowonder *et al*. Fuelwood prices are monitored by the Labour Bureau, Shimla. According to their records, the fuelwood prices in some of the major towns of India have fluctuated as given in Table 3.

6. SOCIAL FORESTRY PHASE 1975-1990

Thus, although estimates vary about the quantum of increase, fuelwood prices did increase until 1985. This increase seems to be the rationale for investment in social forestry projects. As forest policy till then did not give adequate importance to fuelwood supplies, how does then one explain the `discovery' of a woodfuel crisis by policy makers in India and other developing countries in the mid-1970s? Two explanations have generally been advanced (Agrawal 1986: 3). One, the oil crisis of the early 1970s led the developing countries to a general re-assessment of their energy options in favour of bio-fuels. Second, deforestation, land degradation and other ecological consequences were linked in the minds of policy makers with

insatiable demand for fuel gathering by the rural people. This put increased pressure on the reserved forests, and hence in order to reduce this pressure, fuelwood production had to be increased. For instance, the National Commission of Agriculture (NCA) recommended growing trees on lands accessible to village people. To quote from its report:

Table 3: Changes in Fuelwood Prices in Major Indian towns During the Period 1960-85 (Rs per 100 kg)

City	1960	1975	1980	1985
Kanpur	6.1	21.0	34.0	74.7
Saharanpur	5.8	25.0	35.2	70.9
Yamunanagar	8.3	25.6	39.8	85.3
Jaipur	7.8	23.2	32.6	66.7
Ajmer	8.6	26.2	45.1	63.9
Bhopal	5.5	19.2	23.7	65.9
Indore	5.7	24.3	29.1	68.8
Bombay	8.5	36.8	47.4	109.0
Sholapur	8.9	23.4	41.4	65.0
Ahmedabad	9.2	28.3	37.3	73.4
Bhavnagar	8.0	25.0	30.0	41.7
Gudur	6.9	13.9	26.1	43.5
Hyderabad	6.6	23.2	34.4	67.6
Coimbatore	7.3	22.1	40.2	75.0
Madras	8.2	25.4	44.9	64.0
General Price Index (1979-71=100)	61.0	173.0	257.0	358.0

(Singh 1988)

> "Free supply of forest produce to the rural population and their rights and privileges have brought destruction to the forest and so it is necessary to reverse the process. The rural people have not contributed much towards the maintenance or regeneration of the forests. Having over-exploited the resources, they cannot in all fairness expect that somebody else will take the trouble of providing them with forest produce free of charge. .....One of the principal objectives of social forestry is to make it possible to meet these needs in full from readily accessible areas and *thereby lighten the burden on production forestry*" (GOI 1976: 25). (our emphasis).

Thus social forestry was seen by the NCA as a programme which would release industrial forestry from social pressures. The core area was still reserved forest lands, and the core objective remained production of commercial timber. But in order to keep people out it was necessary to make them produce what they consumed free of charge using community lands to draw off some of the pressure on forest lands.

Social forestry projects in India are now more than a decade old. These were designed to reduce pressure on forest lands by increasing tree production on presently unproductive non-forest private and community lands and to make fuelwood and other subsistence goods available to the rural communities. These projects were not taken up on forest lands, where the objective continued be produce timber for markets. However, as state funds got locked to meet the matching contributions required for external assistance for social forestry projects, forest lands were starved of funds, with several adverse effects. The neglect of forest lands hurt forest

dwellers and tribals. It reduced timber supplies to the markets, resulting in price escalation. This increased smuggling which led state governments to clamp stricter laws on harvesting, movement and sale of trees even from private land. These regulations hit poor farmers worst, having dispersed production units and being late entrants to the markets.

Second, as deforestation from forest lands was perceived to be due to fuelwood and fodder demands of the people, it was assumed that given government help people would willingly invest their labour and capital in raising fuelwood and fodder trees. However, as fuel and fodder were often collected free, both farmers and village councils preferred income-generating trees, and continued to collect branches, twigs, leaves and grasses from forests as before. This, combined with reduced allocations for forest lands, led to faster degradation of these lands.

6.1 Impact of Social Forestry on Rural Fuelwood Availability

The fact that social forestry projects did little to improve fuelwood supplies for the poor rural people is documented in several studies. The Tamil Nadu Social Forestry Project began in 1981-82 with the primary objective of meeting the fuelwood and fodder needs of the poor. Most of the community forestry plantations were on village tank foreshores. Its evaluation (SIDA, 1988) indicated that output from tank foreshore plantation was not being used to meet local demands for fuelwood, but was being sold to urban areas. The Addl. Chief Conservator of Forests, Tamil Nadu admitted (Wilson, 1986: 309) that only 5.7 per cent of the total quantity of wood produced in community forestry programmes was actually utilised by the rural people, the rest was all sold to the urban areas. The village councils utilised the proceeds for purposes such as repair of roads, schools and drains, but there were also instances of questionable utilisation, like payment of telephone bills and travel of the council chief (Shepherd 1987). Providing tree cover to common lands also meant depriving access of the poor to grazing lands.

A World Bank/USAID team after touring U.P., Gujarat, H.P. and Rajasthan in Feb/March 1988 found that commercial species planted by the F.D. on grazing lands tempt the village councils to sell in the markets, rather than distribute in the village. On these same lines, the powerful non-officials controlling village councils in Karnataka insist on auctioning eucalyptus, rather than distributing it to villagers. In village Medleri, district Dharwar (Karnataka) a local voluntary organisation had to obtain a stay order from the High Court against the auction of eucalyptus to urban contractors (Indian Express, 23rd April, 1988 and Deccan Herald, 23rd July, 1988), pleading for equal distribution to all families within the village.

From the above examples and several other evaluation studies it is now well established that community forestry, even where it succeeded in terms of physical production of wood, may have enhanced supplies of fuelwood to urban areas, but it did nothing to help the deficit of fuelwood in rural regions, nor did the poor and landless benefit from it beyond wages.

There were several reasons for limited impact of community forestry on the availability of rural fuelwood. First, there appears to have been a misdiagnosis that given access to land and funds, communities and the poor would prefer fuelwood plantations to trees for food or fodder on village lands. This is not to deny the hardships of many of the rural poor in collecting fuelwood. But the poor were not consulted about their priorities. Fuelwood was rarely their most acutely felt need: for one thing, in many parts of India the spontaneous spread

since the l960s of Prosopis juliflora has provided a vast new fuelwood resource for the poor. A World Bank Report (1988: 27) too called for a reappraisal of the original premises, as "fuelwood is a lesser priority for rural households than increased income". The latest evaluation of Tamil Nadu Social Forestry Project done in late 1992 showed that fuelwood is hardly a problem in rural areas due to plentiful availability of prosopis shrubs. Moreover, the poor face many other shortages and have many other concerns besides fuelwood including food, employment and cash. "For rural communities, woodfuel is only one useful product of trees, trees are only one form of woody biomass, and woody biomass is only one aspect of much broader farming or landuse systems. Woodfuel problems must therefore be tackled indirectly." (Leach, 1987). It was a mistake to assume that fuelwood shortages faced by the poor could or should be solved in isolation from other aspects of poverty, or that fuelwood would necessarily be their preferred priority benefit from trees on village lands.

Second, shifting of subsistence needs from forest lands to village commons assumed a similarity of land-use and substitutability of need fulfilment from one type of land with the other. In practice, the three types of land have different usage; forest lands for fuel, small timber, medicine, fodder, and other subsistence requirements, village commons for pastures, threshing ground etc., and private lands for food and cash.

Third, often only small areas of say 2 to 4 ha have been available in villages. The entire area has then been taken up for afforestation in a single year. This has then caused hardship to those whose livestock depended on the commons for grazing. Such a small area is liable neither to satisfy the fuelwood needs of the village, nor to promise sufficient non-monetary returns to village leaders who are expected to devote their time and energy to raising the woodlots. Often covering village commons with trees has led to deforestation in a remote forest area, which was then used for satisfying peoples' those needs which were earlier being met from village commons.

The last and most serious reason for the poor performance of community plantations has been the failure to define, establish and publicise the rights to the trees and the procedures for marketing and allocating benefits. A government evaluation of Orissa S.F. Project (GOO, 1987) indicated that 82 per cent of the villages did not know how the produce from village woodlots would be distributed. Most of the people did not expect any share from the final output. They looked upon such woodlots as another category of reserved forests. The mid-term evaluation report (CIDA, 1988: 51) of Andhra Pradesh observed, "Final benefit sharing agreements are neither finalised nor formalised, which obviously causes uncertainties in the minds of beneficiaries."

Rights to trees and distribution policy are not official preoccupations in the early stages of tree planting, but are very important for the people. Unless they are clearly defined and credible from the start, the chances are high that benefits will be unfairly distributed later. In our judgement, uncertainty about the distribution of benefits and who will gain and how is the most important factor in explaining the poor response of the people in community forestry.

6.2 Farm Forestry

The other component of social forestry, of planting trees of farm lands and called farm forestry in India, was more successful (than planting on village lands) in terms of sheer number of survived trees. Between 1980 and 1989 farmers raised about 10,550 million trees on private lands (Chambers *et al*. 1989: 171). Independent estimates put the figure of survival around 60 per cent (IIPO, 1991). Taking the number of farm households

in India as around 80 million, the average number of surviving new trees per farming family comes to nearly 75. This is by all means an impressive achievement. Several features of this programme deserve to be noted.

First, government had hoped that farmers would grow trees for meeting their subsistence needs. However, trees were planted more for sale as poles and pulpwood than for use as fuelwood. The main motivating force behind the success of farm forestry was to grow wood for the market (FAO 1986: 77-79). Second, with some exceptions, its geographical spread has remained confined to a few surplus regions such as north-western region, where in place of wood dung is the main domestic fuel. Third, even in these regions the initial enthusiasm for farm forestry could not be sustained after 1986. This is largely due to the unpopularity of eucalyptus (*E. tereticornis*), which was the main farm forestry species, with farmers in those very states where it had been extremely sought after a few years earlier.

Several factors explain the rejection of eucalyptus by farmers. Due to poor forestry practices, eucalyptus did not grow to timber dimensions and thus the farmers could not benefit from the high timber practices. The pole market got saturated due to over-production and pulp mills preferred subsidised supplies from the Forest Department plantations. Ultimately, much of eucalyptus wood is now being sold as fuelwood, at less than the expected price, causing disappointment to tree growers. Thus farm forestry did stabilise urban fuelwood prices in some regions, though this was not the intended objective of farmers.

Fourth, the farm forestry programme made little impact on the vast subsistence regions, like the paddy growing eastern India, the Himalayan uplands, other mountains and hills, the Chotanagpur plateau in South Bihar, and almost all tribal and heavily forested districts of central India, as also on much of the millet growing Deccan plateau. Together, these regions may account for more than two-thirds of the country's land mass.

Thus the status of afforestation efforts during the social forestry phase 1975-90 on the three types of lands - forest, community and private - can be summarised as follows:-

1. Degradation of forest lands has continued unabated, because either these lands were not taken up for afforestation under the Social Forestry Programme, or viable models of sustainable development were not conceived, at least until 1990.

2. Social forestry on community lands, though attracting most of financial resources, has also run into problems, as sustained management of such plantations by village communities became doubtful.

3. With some exceptions, the farm forestry programme remained confined only to the commercialised and monetised regions of India, and made little impact on the vast subsistence regions. Even in regions where it was successful in the early 1980's, it could not be sustained after 1986.

Thus it appears that the social forestry policies for fuelwood and for the management of tree resources in India were either imperfect, or detrimental to the objective of sustainable afforestation efforts, as these incentives did not give the desired results.

7. FUELWOOD PRICES AND REGIONS

Before we come to recommending as to how to increase production of fuelwood on the three types of land - forest, village, and private - it is relevant to point out that fuelwood prices seem to have declined in real terms after 1985 in many towns of the country, as shown in Table 4. In north-west India the glut of eucalyptus explains the decline in fuelwood prices. In some regions the fall could be due to the natural spread of *Prosopis juliflora* shrubs on public lands, which provide excellent fuelwood for both consumption and sale at almost zero opportunity costs to the poor.

Table 4: Fuelwood Prices for Urban Consumers in Real Terms at 1997-1991 Prices in Rs. Per 100 kg

City	1985	1986	1987	1988	1989	1990
Kanpur	21	21	24	23	23	22
Saharanpur	20	24	21	18	17	19
Yamunanaga	24	22	22	22	21	21
r	19	17	16	16	17	17
Jaipur	18	19	19	19	22	22
Ajmer	18	20	20	18	25	24
Bhopal	19	20	20	18	29	30
Indore	30	33	32	30	31	32
Bombay	18	17	17	18	19	19
Sholapur	21	20	19	18	20	19
Ahmedabad	12	11	12	16	18	17
Bhavnagar	12	13	10	11	13	12
Gudur	19	18	17	16	16	15
Hyderabad	21	20	20	19	18	18
Coimbatore	18	18	18	20	20	19
Madras						
	19	20	19	19	21	20
Average						

These have been calculated at 1970-71 prices by using the all-India general price index. More accurate would have been to use the price index of that particular town, which was not readily available. This Table shows that the behaviour of prices during this later phase was quite different from the earlier phase of 1975-85.

As a consequence, to speak of a "fuelwood problem" in India is somewhat meaningless. Land production capabilities and access to tree resources vary from region to region and this has an impact on whether energy for cooking is a problem for people in the rural areas. Some of these regions could be

1. with proximity to forests
2. fertile and irrigated cultivated lands
3. areas with access to Prosopis shrubs
4. areas where farm forestry has been a success
5. areas where dung must be returned to fields for maintaining productivity

Although empirical data on each of these regions is sadly lacking, one could hypothesize on the basis of field experience that fuelwood is an acute problem more in the first and last type of regions, which may cover roughly half of India's geographical area. In regions 2 and 4, there would be a class dimension too, that is the poor and landless may face shortages, even when it is not an issue for the surplus farmers. In forest regions, the issue is not of physical scarcity but of lack of incomes, which leads the poor to do headloading. Moreover, while planning landuse one should not neglect ownership and tenurial issues, which often determine how land is likely to be used, and hence the suggestions in this paper are discussed separately for each ownership category of land. On private lands, for instance, even women may not regard production of woodfuel as top priority. Their immediate preoccupation is the need for quick solutions to desperate food and income deficits (Cecelski 1987). Thus the earlier social forestry projects, in focussing only on fuelwood, proved insufficient in defining what is needed at the project level.

8. NEW FOREST POLICY SINCE 1988

Despite these problems and set-backs described in the previous section, there is tremendous potential for development of woodfuel resources in India. About 84 million hectares of land, representing about 26 per cent of the total geographical area of the country, is considered degraded, but suitable for tree planting (Chambers *et al*. 1989). There is plenty of sunshine, and adequate rainfall in most part of the country, due to which trees can grow fairly fast. There are sufficient funds for the forestry sector, at least since 1980, thanks to assistance from multilateral and bilateral donor agencies. Notwithstanding failures, funding for this sector has continued on a liberal scale.

The favourable biological potential and availability of financial support is buttressed by a change after 1988 in the policy framework governing the management of forest lands, which is somewhat more conducive to sustained development of woodfuel resources, than the previous policies. According to the new Policy, the requirements of fuelwood, fodder and small timber such as house building material of the tribals and other villagers living in and near the forest are now to be treated as first charge on forest produce. Equity and environmental considerations will be given more importance than mere earning of revenues.

In pursuance of this objective the Government of India issued a notification in June 1990 to various State Governments encouraging the involvement of village communities and voluntary agencies for the regeneration of forest land. Already a number of Indian states including West Bengal, Bihar, Himachal Pradesh, Jammu and Kashmir, Haryana, Rajasthan, Madhya Pradesh, Maharashtra, Gujarat, Orissa and Andhra Pradesh have accepted these guidelines and have initiated action to start what are now called Joint Forest Management (JFM) programmes. The new donor assisted forestry programmes in these states are likely to depend heavily on Joint Forest Management concepts. Thus funding support for forest lands is likely to be much better than it was during the last fifteen years.

8.1 Evolution of JFM

The guidelines issued by the Government of India are based on the success achieved in a pilot project begun in the 1970s in Arabari, in southern West Bengal. This project was based on involving communities in the protection of degraded public forest lands dominated by sal. In return for protecting the sal forests, the Forest Department agreed to give villagers all non-timber forest products (NTFPs) and 25 percent share in timber. This arrangement proved

to be quite successful: the project demonstrated that with the aforementioned incentives, villagers would protect the natural sal forests from fuelwood cutting; and it demonstrated that with the benefit of this protection the sal would rapidly regenerate, due to its ability to coppice. In addition to the sal, a wide variety of productive species normally associated with sal also began to flourish, resulting in a steady increase in income to women collecting non-timber forest products. Senior foresters in the state were so impressed with these results that by the mid-1980s they advocated extension of the project to similar ecological zones throughout southwest Bengal.

By the end of 1989 community-based forest protection committees were protecting approximately 152,000 hectares of forest land. Certain socio-political milieu conducive to participatory management existed in West Bengal. The Marxist government (continuously in power since 1977) gave political support to the idea of political decentralisation, and strong village councils emerged in the state. Fortunately, sal and its associates in south West Bengal give many minor forest products, such as sal seeds and sal leaves, which sustain the interest of the poor villagers in protection. Furthermore NTFPs are seasonal, providing employment in periods when other labour opportunities may be scarce, are often collected and marketed by women and children, and have important cultural, religious and aesthetic values as well. The success of the West Bengal experiment, as already stated, attracted attention at the federal level and support for nation-wide replication.

8.2 Replicability of West Bengal Experience?

Joint Forest Management is a fairly new concept. While it has been a big success in West Bengal, it is too early to pass a definitive judgement on its implementation in other states. The critics of the programme point towards peculiar conditions prevailing in southwest Bengal; favourable political climate, commercial value of forests being almost nil since atleast 1960s, forests being sal dominated which not only coppices well but gives useful non-timber products on a recurrent basis, topography of forests which makes each forest coupe identifiable with only one village and being quite remote from other villages, ethnic homogeneity of population in many villages, and peoples' fuelwood demands being met from the eucalyptus plantations done by them on private lands and thus reducing their dependence on forest lands.

On the other hand, supporters of the programme argue that there is no need to be unduly pessimistic about its success in other states. There are many instances from throughout India where people on their own initiative started protecting forests, of which CHIPKO and SUKHOMAJRI are well-known examples. In some other areas, growing resource scarcity has spurred many communities to protect their disturbed environments to allow natural regeneration, which is independent of government initiative. The view that community participation is an empty slogan, or can work only on very small areas in exceptional circumstances, or that rigid stratification of village society in India inhibits development of institutions representing a common will, appears simplistic and over-stretched in the face of positive evidence of community action from diverse agro-ecological zones. In Orissa and Bihar, for instance, more than 200,000 ha each is under informal protection by the forest communities. Even if it is assumed that most effective local institutions develop in those small communities where people know each other, it should be remembered that most forests in India are located in the hills, uplands and tribal regions which have ethnically homogeneous communities living in small and less populated villages.

8.3 Constraints of Government Policies

Rather than trying to locate barriers to community action in structural and sociological factors, greater attention needs to be paid to governmental policy, which has often hampered such initiatives. Some of these are listed below.

9. LEGAL ISSUES

The legal and organisational framework for joint management remains weak and controversial. In many states, villages distant from forest areas have settlement and use rights. Thus, a forest patch does not have a well-defined and recognised user-group, admitting the rights of the entire population of that region or the entire forest area. This kind of a `right-regime', which makes forests open-access lands, is not conducive to successful protection, as rights of contiguous villages protecting forests may come in conflict with those of distant villages, not protecting but still having rights to enjoy usufruct. Therefore, at least in JFM areas, use rights should be reviewed in order to put them in harmony with the `*care and share philosophy'* which is the basis of JFM.

Another legal problem concerns the status of village communities. The state government resolutions recommend village level committees as functional groups. However, these committees have no legal and statutory basis, and it may be difficult for them to manage resources on a long term basis. Their relationships with the statutory village Panchayats will need to be sharply defined.

10. OVERHAULING FOREST POLICY AT STATE LEVEL

It is not known whether any state government issued any directive revising its state forest policy after the radical overhaul of Forest Policy by the Government of India in 1988. The new National Forest Policy of 1988 laid down that the forest-based industry should meet its raw material needs by establishing a direct relationship with the farmers rather than depend on forest lands, which would henceforth be maintained primarily for ecological functions, and for meeting the subsistence needs of the people. In keeping in tune with the new Policy species choice and silvicultural practices will perhaps need a change in favour of usufruct based trees and multiple outputs. Where a large number of people have claims to forest produce, low management and low value output (but high in biomass) solutions have perhaps a better chance of success. However, `business' seems to be as usual in state governments, and commercial trees are continued to be encouraged and planted on forest lands.

11. COORDINATING JFM WITH OTHER DEPARTMENTS

Relationship of the JFM with Social Forestry Programme has to be spelled out. Within one forest department there are likely to be separate divisions for social forestry and territorial forestry. Since JFM is under the jurisdiction of the territorial division alone, it is possible that two different rangers and their respective staffs could be working in the same village with different mandates: JFM on forest land, and social forestry on non-forest land. One would like to advocate a merger of Social Forestry and Territorial Divisions. The reason is that mere

protection of a not-so-degraded area may transfer biotic pressure to some other area. Therefore production of biomass through quick growing shrubs, bushes and grasses must be undertaken on more degraded lands, so that peoples demands are met in a sustained manner from these bushes and shrubs, while people protect forest lands in anticipation of more valuable NTFPs and forest products. The issue of how to meet the economic needs of the people for the first few years, during which they have to reduce their dependence on the protected land must be faced squarely. It is impractical to expect that people will give up grazing or reduce their consumption in "national interest" without expecting any tangible gains in return.

12. PEOPLES' PREFERENCE - SHARE IN MANAGEMENT OR INCREASE IN LIVELIHOOD GOODS?

Of the estimated 30 m ha of degraded forest lands, roughly 12 m ha has good quality root stock, which could be regenerated through protection, but the rest will need some enrichment plantation too. Even in people protected areas, a share in final produce (obtained after several years of waiting) itself may not be sufficient to enthuse a community to protection, as they need seasonal incomes. In the long run, it is not management which attracts people to forests, nor rights in forests, but the lure of obtaining livelihood products (which sal and its associates give on a continuous basis in West Bengal). It is the drastic increase in their incomes through enhanced supplies of NTFPs, which may induce people to give up grazing in forest lands, or invest their labour in its protection. Thus, in order to seek peoples' cooperation, it would be better if they can be guaranteed more output to gather from forest lands.

This can be achieved if social forestry is extended to reserved and protected forest lands by changing the nature of species from teak, eucalypts and pines to usufruct based trees, such as neem, mahua, karanj, sal, arjun, and palmyrah. These should be supplemented with grasses, shrubs and bushes to yield fuelwood and fodder in the shortest possible time.

This requires a complete and explicit reversal of the recommendations of the National Commission on Agriculture, 1976 which favoured commercial plantations on forest land, and trees for consumption and subsistence on private land. Our recommendation is that subsistence and consumption should be met from forest and common lands, and market demand should by and large be met from private land. Using private lands for short rotation products will permit the large area of forest lands to be used for long gestation trees, which enrich the environment and provide a range of products to the poor. "Scientific" forestry should therefore mean that wild fruits, nuts, MFPs, grasses, leaves and twigs become the main intended products from forest lands and timber a by-product from large trees like tamarind, jack and sal. The reverse has been the policy for the last 100 years.

Although the above suggestion has been accepted to some extent in the new Forest Policy, but its implementation relating to a change in the choice of species by the states has still not begun. In none of the states, commercial species are being discouraged on forest lands. Sharing management of forest lands to the people is an important goal, but the process will proceed at different paces in different conditions. In the meantime, what is essential is to develop usufruct-based trees, shrubs and grasses on degraded forest lands to meet their livelihood needs. Practical political economy considerations suggest that technology is easier to change than institutions.

Much of the confusion has arisen in the past because we look at social forestry as one composite programme, and assume that its components like farm forestry and afforestation of

forest lands have similar integrated and mutually supportive objectives. Experience of the last 10 years shows that these two programmes are entirely different and often contradictory in their objectives and approach. For instance, farm trees grown to generate income are unlikely to benefit those with little or no land. Farm forestry and agroforestry should aim at maximising sustained economic returns from land, whereas public forestry should aim at maximising welfare through production of such commodities like fuelwood, fodder, MFPs etc which are needed by the people. The choice of species would also be different for the two programmes. Short duration exotics, which give high market value would be suitable for farm forestry, whereas species which have their value in the crown, and not in the stem would be suitable for public forestry. The differences between the two programmes are illustrated in the Table 5.

Table 5: Differences in Farm Forestry and Public Forestry

Indices	Farm Forestry	Trees on Public Lands
Use of land and labour	intensive	extensive
Use of other inputs like water and fertiliser	often used	rarely applied
Nature of output	high value, to meet market demands	fuelwood, MFPs and fodder
Ownership and control	farmer	government, or joint
Species	value in stem, often monoculture, fast growing	value in crown, mixed forests, may be slow growing
Benefit to landless	nil, or at best indirect	could be substantial
Objectives	to maximise economic returns	to maximise welfare

Therefore, while both components are to be included, their objectives should be separately defined, so as to avoid any misuderstanding.

Another area of confusion has been as to what constitutes fuelwood species. There are two divergent perspectives. According to foresters fuelwood is obtained by felling trees having a high calorific value, or as a by-product from lops and tops of timber trees. Casuarina and eucalypts therefore seem perfectly justified on public lands. But the poor obtain fuelwood from twigs and branches of living trees, and not by felling trees, and often get little from the felling of so-called fuelwood trees. Casuarina and eucalypts may be justified on farm lands, if they improve farm incomes on a sustainable basis. But these hardly serve the poor, when raised on public lands. Therefore in the other perspective fuelwood production is increased by planting shrubs, bushes, and other such trees which have their value in the crown (leaves, twigs, branches etc.), so that the poor may gather these output without any competition from the rich and contractors. Bushes and shrubs are better providers of fuelwood to the poor. What people get out of trees can depend more on what is planted than on who manages.

12.1 Benefits to the Poor

The policy suggested above would strengthen access of the poor to forests, as species suitable for individual gathering by households would be planted, and therefore benefits would be directly appropriated by the poor. Unlike commercial timber species, relatively low value nonirritating trees for recurrent products would not so much attract the attention of rich farmers and contractors.

Thus there would be a world of difference between plantation of eucalyptus and of *Prosopis juliflora* on roadsides. Eucalyptus benefits urban markets and industry, whereas Prosopis can not only solve the fuelwood problem of poor families, but also generate self employment for the poor. What is significant about Prosopis, ber, neem, mahua or other trees which can be continuously harvested for fuelwood and other intermediate products is that they do not require decisions about market shares between rich and poor. Their usufruct is not of much interest to the rich, or is available to them only through gathering by the poor, so that by default the benefits are available for the poor.

Prosopis juliflora is a neglected tree in conventional forestry. Although the Forest Department ignores it in social forestry projects, it grows naturally on degraded soil. Field studies by the author in dry areas with low employment opportunities in the slack season like Anantpur in Andhra Pradesh (CIDA, 1988), and Mathura in U.P. (Saxena, 1988) show that prosopis on its own has solved the fuelwood crisis, besides providing employment to many who prune the branches and sell it in urban areas. A study shows that its yield on degraded soils in Bhavnagar was as high as 3 tonnes per ha per year (Patel, 1987). Prosopis produces double the biomass on similar soils as compared to eucalyptus (Banerji, 1986), and yet is considered by the Forest Department to be a "low" value tree. In the Central Board of Forestry Papers (GOI, 1987) it has unfortunately been described as a weed. One may recall that until the first two decades of this century bamboo was also described as a weed, till its use in the paper industry was discovered, which led to its plantation on a large scale.

Another way of looking at this issue of afforestation on public lands is to opt for species which have high proportions of branches and twigs relative to stem wood. Given the inefficiency of administration and `soft' character of the political system, one could generalise that out of a tree the stem goes to the rich and the towns, whereas branches and twigs belong to the poor. The proportions of stem wood and branches calculated for some trees are presented in table 6.

Table 6: Proportion of Stem Wood and Branches in Trees

Species	% in Total Biomass		Total Biomass Dry Tonnes/ha
	Stem Wood & Bark	Branches & Twigs %	
Eucalyptus	81	19	17.4
Subabul	77	23	23.0
Acacia nilotica	47	53	31.6
Prosopis juliflora	30	70	32.2

(Reddy, 1987)

This Table indicates the superiority of Prosopis to eucalyptus both on grounds of equity and potential biomass per ha. But despite government's clear instructions to discourage eucalyptus on public lands, its percentage in 1986-87 in U.P. on non-private lands was still 21.2 per cent, whereas Prosopis spp. accounted for only 1.8 per cent (IIPO, 1988: xiv), although even on technical grounds Prosopis juliflora is a more suitable species for the saline/alkaline wastelands of U.P.

12.2 Economic Implications

Since the demand for marketed wood in India is limited, by duplicating the same species like Eucalyptus on forest lands as on farm lands, we are ultimately cutting into the profits of the farmers, and thus undermining the farm forestry programme itself. It would be ironic if production of eucalyptus on farm lands, which is far cheaper, is discouraged because of production of more expensive eucalyptus on government lands. The approximate figures for demand and supply in the country are shown in Table 7.

Table 7: Demand and Supply of Wood in India

Type	Demand	Supply
Timber	13	6
Pulpwood	6.4	3.2
Fuelwood	157	95
Poles	na	na

(but considered to be much less than pulpwood)

The above table shows that the demand for commercial wood, although at present unsatisfied, is only a small fraction of the demand for fuelwood. The gap of 10 mT between supply and demand of timber and pulpwood can be met from an area of 3 m ha, assuming a low productivity of 3 tonnes per ha per annum. Thus the required area under new industrial plantation is far less than the available 36 m ha of degraded forest land, an equal area of marginal and semi-cultivated farm land, and 13 m ha of village lands. Obviously if all degraded lands were to produce timber and pulpwood there would be no market for the output.

On the other hand, there is a huge gap between supply and demand for fuelwood. As it may not be economically viable for farmers, or village councils to produce fuelwood, except on lands with low opportunity costs, or as a by-product, fuelwood for collection from twigs and branches, shrubs and bushes should be produced on public lands. Farmers are more concerned with their private consumption and incomes, and it is not fair to load upon them national concerns of demand from the poor. This places heavy responsibility on public lands which have to cater to the requirements of the poor. The likely scenario in 2000 A.D., if no corrective measures are taken, is that there would be wide and yawning gaps between the supply and demand for MFPs, fuelwood and fodder. The 35 mh of private degraded land would only indirectly produce fuelwood or fodder as a by product, as it is likely to be targeted to produce timber, pulpwood and other multiple use trees.

13. VILLAGE LANDS

The suggestions for afforestation of village lands are summarised below.

The present practice of "taking over" common lands by the F.D. should be stopped, or drastically reduced to experimental projects. Funds for afforestation should either be transferred to the village community. The role of the Forest Department would be mainly extension and technical support.

Generally only a small area is available in the village. If afforestation is left to the village councils, it would take up only a small portion, and thus plenty of area would be left to be used by the poor for grazing.

Model afforestation schemes should be prepared for implementation by the village councils. These should be widely circulated, and village councils should be encouraged to apply for funds. Such village councils which are capable of looking after plantations should be given funds in the first instance. Their example and good work should then be publicised so as to encourage many others to take advantage of the schemes.

Where village councils represent several villages, single village organisations as in the UP hills and Orissa should be created. Finally, distribution of produce is better done on the basis of one household one share.

As production of grass increases through afforestation on public lands, greater attention should be paid to its storage, so that fodder is available in lean months too.

Often more degraded lands are available in larger chunks, but these are not taken up as the cost of reclamation would be high. However, in the long run, it is better to afforest these, as they have better demonstration effect, satisfy local demand, and offer better management possibilities.

14. FARM FORESTRY

As this could be the most viable and sustainable programme of production of wood (as complicated questions of tenure are not involved here, and most farm lands in India are under secure tenure), we are discussing the constraints and policy implications in some detail for the three important regions of India - wheat and cash crop growing west and north-west, paddy growing eastern region, and millet producing peninsular India. As already pointed out, farm forestry succeeded only in agriculturally surplus regions. The reasons are not far to seek.

Unlike seasonal crops trees, even the fast growing ones, take 6 to 10 years to mature. A long gestation period delays benefits and reduces a family's income from land in the intervening period. Thus, the tree farmer needs support during the years of "no income" throughout the period trees remain on farm. Trees grown for cash need to be marketed, and hence the farmer has to locate the market, gain access to it, and obtain permissions from government offices in order to transport and sell his trees.

Therefore tree planting on crop lands for production of wood for sale should be viewed as a long gestation capital investment with recurrent costs, but no recurrent output, till trees matured. Such an investment is therefore likely to be undertaken by farmers and in regions which generate marketed surplus, where there has been a long tradition of growing crops for the markets, where other forms of capital investment in land, like installing tubewell or buying farm machinery, is common, and where profits from land are ploughed back into agriculture.

The western and north-western region of India are characterised by larger holdings, secure means of irrigation, a long history of owner cultivation and cash crops, higher surpluses and its re-investment in agriculture, a higher risk-bearing capacity, and better enterprise. These enable the farmers to maintain high investment and growth rates. There is greater diversification of rural incomes in this region, enabling many farm households to have an alternative source of income. These conditions facilitate investment in long rotation tree crops.

The agrarian structure of the eastern and tribal India is characterised by heavy dependence on grain production, smaller holdings, low overall incomes, a less marketed surplus, imperfect credit markets, more dependence on the village merchant for marketing the small surplus, inter-locked credit and output markets, less monetisation, less diversity of rural incomes, greater debt bondage, a less developed infrastructure for the supply of agriculture inputs, greater insecurity of land tenure, and on the whole poor human capital as far as enterprise is concerned. These conditions can at best promote low intensity tree growing strategies for home consumption, and are not conducive to market oriented high intensity tree planting.

Tree growing has been constrained in the monocropped millet growing peninsular India by a number of factors. First, much of peninsular India is semi-arid, characterised by intense competition for moisture between crops and trees. Unlike khejri (*Prosopis cineraria*) in Rajasthan's arid zone, suitable species which may have strong complementary effects between crops and trees are still to be identified for the region (Walker 1988). Second, young trees require protection from cattle, especially in the fallow season, when the village livestock is let loose to browse agricultural residues and stubbles. During these months in a monocropped village cattle is generally not accompanied by a herder. Semi-arid areas have villages spread over a large area in which individual fields may be far away from village huts, making protection further problematic. On the other hand, in irrigated villages a tradition is slowly emerging of herding cattle during the cropping seasons. Despite ecological necessity and the easy availability of marginal and degraded lands, protection of young seedlings is difficult in monocropped villages compared with irrigated villages.

Third, most of India's forests are also located in areas of backward agriculture. Villages in this region of low productivity often have vast, though degraded, open access lands. Unlike annual crops which are grown on private lands, trees also occur on forest and other public lands. Open access to public lands may vastly reduce the cost of obtaining tree goods for a gatherer, which may work to the disadvantage of a grower. Thus, the concept of trees as a free good to be obtained from public lands inhibits investment of personal labour, land and capital in tree planting. Proximity to forest lands affects private tree growing in other ways too. State often restricts farmers' right to freely harvest the trees on private land in the interest of either conservation or of checking theft from forest lands. These create rigidities in the free flow of products, and increase differences in the prices obtained by different farmers for a similar product. Lastly, if similar products are raised on forest lands, which are marketed through the state machinery, farmers may find it difficult to compete with the state and get a remunerative price, particularly because the traders may be less interested in buying from dispersed producers, and may prefer to deal with the centralised bureaucracy. Evaluation of Orissa Social

Forestry Project (SIDA 1987) noted that raising of Eucalyptus on forest lands by the Forest Department was one of the reason why farmers did not feel attracted to grow commercial trees on their plots. Keeping in mind this analysis, suggestions are being made in respect of farm forestry.

Keeping in mind the above analysis, our recommendations are described below. The paddy growing and the millet growing regions are clubbed together as subsistence regions.

15. FARM FORESTRY IN AGRICUALTURALY DEVELOPED AREAS

First, restrictive laws on cutting and selling privately owned trees should be abolished. Second, government should stop subsidies on government supply of wood to industries, thereby forcing industry to buy from the farmers at a remunerative price. Since the demand for marketed wood in India is limited, by duplicating the same species like eucalyptus on forest lands as on farm lands, we are ultimately cutting into the profits of the farmers, and thus undermining the farm forestry programme itself. Third, F.D. should also initiate schemes for linking farmers with industries, in ways similar to sugarcane. Fourth, the subsidy on seedlings is unnecessary. Free distribution leads to bogus reporting too.

Fifth, farmers should have a range of other short-rotation, high-value species beside eucalyptus and acacia on their land, which meet their various needs, and spread the risk of the collapse of any one market. Economics of each model should be worked out for several future years. This would require assessment of future demand, supply and prices, separately for each species, to be made by competent organisations, and given due publicity. This will help small and marginal farmers to decide what to plant. Diversification in species will also be environmentally better. Sixth, temporary nurseries are able to supply only such seedlings which can be raised in a short time of three-four months. Many high value trees, like teak, require seedlings to be at the nursery stage for a longer period. Hence, temporary nurseries should be replaced by permanent nurseries. And last, research is needed to identify other short-rotation, high-value species besides eucalyptus which suit farmers' requirements of planting on marginal lands and bunds.

16. FARM FORESTRY IN AGRICULTURALLY BACKWARD AREAS

Farmers in these regions follow several traditional age-tested agroforestry practices, but what has been emphasised in the farm forestry programme so far is growing short duration trees in place of annual crops for market. In such cases trees compete with annual crops for land, unlike the traditional practices where trees complement agricultural production. Hence, while planning for these regions, one should have modest targets for trees. However, these are the areas where a lot of degraded land is available, both with farmers and government. The focus should therefore be on pilot projects, complementary agroforestry and watershed development.

Unlike annual crops in which crop decisions are autonomous of similar decisions by other families, a farmer's decision to plant trees in a mono-cropped village has to take into account herding practices in the village, availability of irrigation, distance of the fields from his hut, and the cropping pattern of other farmers. Conditions prevailing outside the farm become as important as simple costs and benefits from the preferred landuse options. In double-

cropped villages, planting or not planting trees is an individual decision, just as is the selection of a cropping pattern, but in monocropped villages, a group consensus is necessary if trees have to be protected during the long fallow season. Hence it is better to concentrate on a few villages in which almost all farmers plant trees, than to take up a large number of villages, and expect that a few plant trees in each village.

For promoting indigenous agro-forestry models in rice and millet growing regions a great deal of research needs to be done to identify species which complement agricultural production, as farmers' primary landuse continues to be crop production. Thus the objective should change from "how can farmers be persuaded to grow trees" to "in what manner technology can help in increasing overall production from marginal lands by meeting farmers' priorities?"

Ultimately the programme must improve the productivity of degraded private lands, if it is to be sustained over a long period. Diversification and adaptability in the Forest Department are required in this direction. In addition, this would require a great thrust in research, as species complementary to crop production for each eco-region are yet to be discovered.

It is difficult to rehabilitate degraded lands without introducing moisture conservation and water harvesting measures. Such measures are needed for all rainfed areas put to biomass production. One should adopt in-situ moisture conservation practices through planting of suitable grasses and trees which may also provide sufficient protection against erosion.

17. LAND OWNERSHIP AND THE POOR

Two points as regards land ownership and the poor need to be noted. First, the poor in India can be broadly classified in two groups. Poverty in wet areas is generally associated with landlessness, as even a small farmer is able to rise above the poverty line because of higher productivity through multiple cropping. The situation is different in dry areas where even a farmer with 4 hectares may be quite poor, with land which hardly produces enough to sustain the family. Here landed farmers often undertake wage labour to supplement their incomes. In such areas poverty is linked with low productivity, rather than with landlessness. In the whole of rural Maharashtra, for instance, 63 per cent of the landless and 60 per cent of farmers owning less than l ha were below the poverty line, while the situation of those with between 4 and 8 ha was not so very different, with still 48 per cent below the poverty line (Blair,1986).

Second, much degraded land has been allotted to the rural poor in the last two decades. About 2 lakh hectares of culturable wasteland was distributed to the poor during the 3rd & 4th Plans under a centrally sponsored scheme (GOI, 1988). Much more significantly, other land allotted includes 1.78 million ha of ceiling surplus land (GOI,1985: 133), and perhaps an equal amount of government wasteland. The allotment of government wasteland in some of the states is given in Table 8 (GOI 1988).

Table 8: Allotment of Wastelands to the Poor in Some States

State	Area (hectares)	Beneficiaries (Nos.)
U.P.	833,459	2,387,870
Andhra	427,200	599,273
Gujarat	240,194	129,301
H.P.	na	55,606
Orissa	260,576	396,326
Tamil Nadu	22,013	na
Bihar	361,600	978,006
Total	2,145,042	4,546,382

In addition, 1.87 million ha of Bhoodan land was taken possession of by the state governments, out of which 0.9 mh has been distributed, mostly in Bihar, Orissa, U.P and M.P (GOI, 1986: 126), making the total allotment of degraded lands of the order of 5 to 6 million ha. These degraded lands often have a potential for growing trees and shrubs through agro-forestry to give more income than the alternative of a feeble or non-existent agriculture.

These figures show that farm forestry need not be a rich farmers' programme only, as it has been so far. The enormous potential for helping the poor through trees on their own degraded lands has scarcely begun to be exploited. To blame their weak economy or their inability to wait while trees mature are not convincing explanations of this neglect, given the evidence of West Bengal Group Farm Forestry Project, and of the Vansda Tribal Tree Growing Project (Chambers *et al*. 1989). Unfortunately, to date tree production on farm lands has been tried only on good quality lands as a substitute for crops. The priority must change from competitive farm forestry to complementary agroforestry.

18. CONCLUSION AND RECOMMENDATIONS

In the 1980s three assumptions dominated the official thinking on fuelwood. First, there is a huge gap between the supply and demand for fuelwood, so much so that India may have sufficient food for its population, but not enough fuel to cook it. Second, the unsatisfied demand for fuelwood is the main cause for deforestation. And third, planting of trees through the social forestry programmes on non-forest lands is the most appropriate response to deal with fuelwood shortage.

Over the past decade, understanding of the ways in which rural people use trees and forests has improved considerably. In addition, several fuel surveys and evaluation reports are available now. It may therefore be worthwhile to analyse the new evidence to re-assess the earlier assumptions.

Studies done by the NCAER, Leach and Reddy show that domestic fuel shortages were much less than had been understood initially. Part of the miscalculation was because official output from forests was assumed to be the major source of supply, and other sources of fuel like agricultural wastes and dung were conveniently forgotten. As both agricultural and milk production has increased at a fast rate in the last decade, so much have the supply of fuels

from crop and animal waste. Second, much of the wood used as fuel comes from twigs and branches, and that too from non-forest lands.

Third, sources of fuelwood change; in the past ten years, more fuelwood has come from *Prosopis juliflora* than from social forestry plantations. In Tamil Nadu alone, the total yield of prosopis for fuelwood accounted as a single species for 75 per cent of the total fuelwood consumption.

This should not be interpreted as an argument that fuel shortages do not exist in India; they still do in many parts for the poor, and in some ecologically fragile areas like the hills for many rural households. But it is necessary to understand the nature of the problem more accurately, if we are to define appropriate interventions. For the poor, the shortage of fuel does not generally feature high among their priorities, for if they are short on fuel, they are most likely to be even more deficit in incomes, cash and food supplies. The poor would certainly like better opportunities for gathering of twigs and branches, not because they burn it all, but these get sold and bring the much needed cash to the family. In the prosopis abundant districts sale of prosopis twigs has emerged as a cottage industry for the poor, specially for women and children.

The problem is more severe in agriculturally depressed areas which do not have the benefit of either dense forest lands, or of natural vegetation of shrubs like prosopis. Why has social forestry done little to reduce fuelwood shortages for the rural consumers in these areas?

But let us first look at the second assumption about the culprits of deforestation. The relative contribution of the two categories of consumers, people and industry, has been a subject of controversy in India, which has blurred its objective analysis. Whereas forest officials blame the poor, NGOs tend to regard urban demand and industry as the main culprit. Both these view points tend to see deforestation as a slow and continuous phenomenon. My own field work shows that it could as well be a discreet and one-time phenomenon caused by sudden changes in laws etc. In addition, increasing marginalisation of small land owners has forced them to seek new avenues of income, like head-loading, and the indiscriminate tree felling by the contractor-official-politician nexus has had a corrupting influence on the forest dwellers, who also wish `to make hay while the sun shines'.

In any case, the debate on who is responsible can hardly lead to feasible solutions, as demand from both sectors, household and commercial, is continually increasing. Controls proposed by foresters to curb headloading or the number of livestock are hardly practical in the Indian political environment. The remedy lies in enhancing supplies through reforestation rather than in demand management. If demands from the people outstrip the demand from industry, as asserted by foresters, why not let the farm sector look after the market demand for timber, and the entire forest lands, both degraded and reserved, cater to meet people's needs?

The advantages in making this policy shift are obvious. First, people's cooperation would be easily forthcoming if reserve forests are used for subsistence oriented trees and mixed forests, the produce of which is gathered, rather than for raising plantation crops. Mahua, neem, fruit and oil bearing trees like ber, karanj and kusum which provide sustenance as well as income to the poor, should be supplemented with shrubs, grasses and bushes to yield fibre, fuelwood (through twigs and branches, and not logs) and fodder in the shortest possible time. Second, given the inefficiency of administration and `soft' character of the political system, one could generalise that out of a tree the thick stem goes to the rich and the towns, whereas low value flowers and fruits, leaves, branches and twigs belong to the poor. Therefore one should opt for species which either give usufruct annually, or have high proportions of branches and twigs relative to stem wood.

Third, trees which provide a lot of leaves, twigs, and branches enrich the soil much better than those which provide poles and timber alone. The objective of soil and moisture conservation would be better achieved through grasses and shrubs, rather than with plantations. Conventional forestry based on clear felling distrupts the annual circulation of nutrients, and increases soil erosion. On the other hand, mixed forests draw and give nutrients to the soil at different stages of their growth, and hence are ecologically far more beneficial than plantations. As opposed to timber, which is product of the dead tree, we would like to emphasize prducts of the living tree - fruits, nuts, flowers and twigs.

But before we extend this concept of people oriented forestry to reserve forest lands, we must look at the experience of the last ten years of social forestry on common and private lands, and the extent to which it has been able to meet the fuelwood needs of the rural consumers.

Although social forestry projects were designed to produce fuelwood, in actual practice market-oriented trees were planted which did nothing to improve the consumption of fuelwood by the poor. The main product of community and farm forestry was eucalyptus poles, which could never reach the rural poor. Then, half of social forestry has been on private lands. As fuelwood was not seen as income generating, farmers preferred income giving trees, and continued to collect twigs and branches from public lands as before. Why would farmers be interested in using their scarce resources of land and capital to generate a product they could collect? It was unfair to load social concerns on farmers if they saw no economic returns. Actually in the states of Punjab, Haryana, Gujarat and U.P., where eucalyptus glut has forced the farmers to sell their trees at fuelwood prices, they have stopped growing trees, as fuelwood prices are hardly remunerative for them to produce it as a commercial product.

Implementation of forestry programmes in India was heavily influenced by the perspectives of foresters and of foreign experts who advised the GOI and the donor agencies. Both of them, because of their training and experience, had looked upon trees as timber, to be obtained after felling. Therefore, even in the social forestry programmes market oriented species were planted.

The traditional Indian way of looking at trees has, however, been different. As opposed to trees for timber, Indian villagers for centuries have depended on trees for their livelihood. There has been little felling. Instead, trees have been valued for the intermediate products they provide, which sustain and secure the livelihoods of the people.

What policy prescriptions follow from the above analysis? First, a distinction must be made between fuelwood from logs and fuelwood from twigs and branches. The former, even if produced on public lands is out of the reach of the rural poor, as it gets marketed, and at best helps the urban poor. The rural poor have access to only twigs and branches, which require labour intensive process of collection and do not attract contractors' greed. Second, such material is best made available to the poor through shrubs and bushes, and not from large trees whose value lies in their stem. Third, as fuelwood shortages are not as pervasive as was earlier thought, the objective of social forestry should be not only to produce twigs and branches, but also to generate self-employment for the poor through the gathering of consumption goods like minor forest products, wild fruits, and mulch. Fourth, the concept of social forestry must be extended to reserve forest lands, where usufruct based trees would be planted along with short gestation grasses, shrubs and bushes. And fifth, farm forestry should be geared to meet the farmers' priorities, rather than national priorities.

In brief, "Scientific" forestry should now mean that wild fruits, nuts, MFPs, grasses, leaves and twigs become the main intended products from forest and common lands timber a by-product from large trees like tamarind, jack and sal. The imperatives of industrial forestry required "keeping people out but allowing contractors in". The policy outlined by us strengthens the position of the gatherers but does not demand "political will" to throw the contractors out, as they would hardly be interested in labour intensive and low market value produce like twigs.

The poor have gained little from forestry because they are not organised, and bureaucracy has failed to deliver to them a share from timber and pulpwood trees. Usufruct-based trees overcome both these problems. Under the new policy suggested by us, technology produces an output which eliminates the need for both social and bureaucratic fine tuning.

19. REFERENCES

Agarwal, Anil & Narain, Sunita. 1985 Strategies for the involvement of the landless and women in afforestation. Centre for Science and Environment, New Delhi. (mimeo).

Agarwal, Anil. 1987. Between need and greed - The Wasting of India; the greening of India; in Anil Agarwal, Darryl D'Monte and Ujwala Samarth ed; The Fight For Survival; Centre for Science & Environment, New Delhi.

Agarwal, B. 1985 Cold Hearths and Barren Slopes, The Woodfuel Crisis in the Third World. Zed Books Ltd., London.

Banerjee, A.K. 1986. Community Woodlot. World Bank, New Delhi(mimeo).

Blair, H.W. 1986. Social Forestry: Time to modify goals? Economic and Political Weekly: 21(30).

Chambers Robert, N.C.Saxena, and Tushaar Shah 1989. To the hands of the poor: water and trees. Oxford and IBH, New Delhi and Intermediate Technology, London.

CIDA, 1988. Andhra Pradesh Social Forestry Project: Mid-term Review. March. Canadian International Development Agency. New Delhi.

FAO, 1985. Tree Growing by Rural People, FAO Forestry Paper 64, Rome.

GOI, 1976. Report of the National Commission on Agriculture, Part IX. Forestry. Ministry of Agriculture and Cooperation, Government of India. New Delhi.

GOI, 1985. Agenda Papers for Conference of Revenue Secretaries and Revenue Ministers, 17th and 18th May, 1985. Department of Rural Development, Government of India. New Delhi.

GOO 1987. *Evaluation of Orissa Social Forestry Project Phase* I, Government of Orissa, Bhubaneswar.

IIPO, 1988. Survival Rate of Trees: 1983-84 to 1987-88. Indian Institute of Opinion Poll. New Delhi.

IIPO, 1991. *A report on the survival Rate of Trees: 1983-84 to 1987-88*. Indian Institute of Opinion Poll, New Delhi.

Leach, Gerald, 1987. Household Energy in South Asia. International Institute for Environment and Development. London.

NWDB. 1988. A Critical Appraisal of Performance and Programme, July 1988. National Wastelands Development Board. New Delhi. (Typescript).

Patel, Himmat, 1987, Agro-Forestry Programmes. Economic Times. 11th November, 1987.

PRIA, 1984, Deforestation in Himachal Pradesh. Society for Participatory Research in India, New Delhi.

Reddy Amulya K.N. 1987. On the Loss and Degradation of Tropical Forests. Department of Management Studies, Indian Institute of Science. Bangalore. (mimeo).

Saxena, N.C. 1987 Commons, Trees and the Poor in the Uttar Pradesh Hills *ODI Social Forestry Network* Paper 5f**.** London: Overseas Development Institute.

Saxena, N.C. 1988 Who owns the trees? Tree harvesting laws in India and its implications for forestry extension. In Shingi, P.M. and Veer, C.P. (eds.) *Planning Forestry Extension Programmes*: India Bangkok: Regional Wood Development Programme in Asia, FAO.

Saxena, N.C. 1990 Trees on Farm Lands in North-West India: Field Data from Six Villages *ODI Social Forestry Network* Paper 11d. London: Overseas Development Institute.

Saxena, N.C. 1991 Marketing Constraints for Eucalyptus from Farm Forestry in India *Agroforestry Systems* **13**(1) 73-85.

Saxena, N.C. 1992 Tree farming in north-west India: recent experiences seen in an historical perspective. In Agarwal, Anil and Narain, Sunita (eds.) *The Price of Forests* New Delhi*:* Centre for Science and Environment.

Shepherd, Gill. 1987. Conflicts and contradictions in Social Forestry Programme. Paper presented at the ODI/IDS seminar, June 1987. Sussex. (mimeo).

Shyam Sunder S. and S. Parmeswarappa, 1987b. Social Forestry in Karnataka. Economic and Political Weekly. November 21.

Shyamsunder, S. & S. Parameshwarappa, S. 1987a. Forestry in India. The Forester's View. AMBIO, Vol. XVI No.6.

SIDA. 1987. Evaluation of the SIDA supported Social Forestry Project in Orissa. SIDA. New Delhi. (mimeo).

SIDA. 1988. Forestry For The Poor: An Evaluation of the SIDA supported Social Forestry Project in Tamil Nadu,

UNDP, 1986. India: Meeting Basic Energy Needs of the Poor. Rish Sharma and Ramesh Bhatia. UNDP and ESCAP. New Delhi.

Walker, Thomas S. 1987. Economic Prospects for Agro-forestry Interventions in India's SAT: Implications for Research Resource Allocation at ICRISAT, Hyderabad. (mimeo).

Westoby, Jack. 1985. Public Lecture at the University of

Wilson Patrick H. and Trivedi Dipak, 1988. Eucalyptus - The five-year wonder VIKSAT. Ahmedabad.

World Bank 1988. *Uttar Pradesh Social Forestry Project (Credit 925-IN), Project Completion Report*. Washington D.C.

GLOSSARY

amla	Emblica officinalis, yields fruit, tannin and fodder
arjun	Terminalia arjuna; host for tasar silk-worm, and excellent shade tree, bark used in native medicine
babul	Acacia nilotica; a small evergreen tree, can stand periodical flooding, hence ideal for tank foreshore afforestation
bamboo	Bambusa arundinacea and Dendrocalamus strictus are the two most common species; wanted by both, paper industry and the poor
ber	Zizyphus mauritania; a fruit yielding tree which is both cultivated and found wild
bhabbar	Eulaliopsis binata, grass which can be used for pulp and also ropes
bhoodan	voluntary surrender of land in favour of government or the poor, often such land is infertile
bidi	local cigarette which uses leaves in place of paper
bouldery lands	lands subject to fluvial action in recent past resulting in the presence of gravel boulders at the surface or in sub-soil
cashew	Anacardium occidentale
casuarina	Casuarina equisetifolia; widely grown in coastal areas for poles and fuelwood.
chiranji	Buchanania latifolia.
chula	small open stoves which use wood, dung cakes or charcoal for cooking
coconut	Cocos nucifera; widely grown on private lands in coastal India. Every part of the tree is used.
community forestry	growing and protecting of trees on non-private and often non-forest lands, which are known as revenue lands
coppice	re-sprouting of trees after felling
crore	10,000,000
crown cover	area covered by leaves and living branches of a tree
farm forestry	practice of growing trees by farmers on private lands
forest dwellers	living inside or in the close viccinity of forests

forest villages	villages set up by the Forest Department inside forests to ensure timely supply of labour for forest to ensure timely supply of labour for forest operations
gaon sabha	village council
jack	Artocarpus integrifolia; a large evergreen tree with dense crown, yields large fruit weighing 5-15 kg
jamun	Syzygium cumini; a large evergreen fruit yielding tree; bark and seeds are used medicinally
karanj	Pongamia pinnata; a multi-purpose tree used for fuel, fodder and medicines. Seed contains high percentage of oil
khair	Acacia catechu; its wood yields commercial catechu which is used for dyeing and tanning
kusum	Schleichera trijuga; used as a host for the lac insect, seeds yield medicinal and hair oil
lakh	100,000
mahua	Madhuca indica; occurs most commonly near tribal habitations in Central India, flowers and seeds are rich in oil, and are eaten
mixed forests	forests raised for preserving biological diversity and ecological stability which provide a variety of livelihood goods to the gatherers
mulberry	Morus alba; leaves are used as food for silk-worms, fruit is eaten,and its wood is used for sport goods
non-rotational	Trees which are used for recurrent benefits of trees fruits, leaves etc. There is no organised felling of such trees. This type of management is also known as physical rotation.
neem	Azadirachta indica; considered a sacred and health-giving tree because of its insecticidal and medicinal properties
oak	Quercus spp., multiple use trees, used for fodder and making agricualtural implements
palmyrah	Borassus flabellifer, used mainly for extraction of toddy. Leaves are used for thatching and for carrying water
panchayat	village council, lowest form of local government, consists of elected members headed by a chairman
panchayat lands	non-private lands under the control of village councils
pastures	open access lands meant for grazing; often highly degraded

patta	literal meaning is contract, refers to leasing of government land on specific terms, also means title deed to land
poles	wood of diameter less than 20-25 cm, which is generally used for scaffolding and as posts
poplar	an agroforestry tree, has grown well in Haryana, Punjab and western U.P., timber used for matchwood, veneer and sport goods
production forestry	growing of trees of commercial value on forest lands
revenue lands	lands under the control of revenue department, these are non-forest and non-private lands, often highly degraded
rotation	time interval between regeneration of a tree and its felling
sabai grass	Eulaliopsis binata
sal	Shorea robusta; a common but slow growing large tree in Indian forests. Yields both timber and important MFPs like seeds and leaves
sapota	Parkia roxburgii, gives fuel, fruit and medicines
sarpanch	chairman of Panchayat
sarpagandha	Rauwolfia serpentina
sheesham	Dalbergia sissoo; a favourite road-side tree in north India, wood used for wheels, boats and furniture
sisal	Agave spp., yields fibre and binds soil
social forestry	programme of growing trees to satisfy rural needs of fuelwood, small timber and fodder
stylosanthes	a cultivated grass of high nutrition value
subabul	Leucaena leucoephala, a fast growing nitrogen fixing tree yields both fodder leaves and fuelwood, despite efforts it plantation has not been successful outside Maharashtra
tamarind	Tamarindus indica; an evergreen multi-purpose tree, yields edible sour fruits, fodder and timber
tasar	silk tasar, a product of insects which are cultivated on the leaves of arjun and sal trees
teak	Tectona grandis; highly valued for quality timber used in furniture, house building and cabinets

tendu	Diospyros melanoxylon; used as wrappers of tobacco to produce bidi, Indian cigarettes,
timber	tree logs of more than 25 cm diameter, used for making sawn planks
tribals	nomadic people who till recently lived by hunting and gathering of forest products

Relating Macro-Economic and Sectoral Policies To Wood Energy Supply and Use

by

John Soussan[1]

1. INTRODUCTION

This paper has been prepared for the FAO/RWEDP seminar on policy instruments for the implementation of wood energy development programmes. The policy proposals in this paper are based on several years work on analysing fuelwood problems and solutions in South and South-East Asia and elsewhere; work which includes a series of projects for official development institutions such as the World Bank, the European Commission, the UNDP, the ODA and others in Nepal, Sri Lanka, Bangladesh, the Philippines, Thailand, Myanmar and Indonesia.

This body of work includes both national-level policy analysis and the formulation and evaluation of field-level projects. This combination has provided insights into the tensions which exist between developing approaches to complex and multi-sectoral fuelwood problems which, on the one hand, are able to capture the specifics of individual localities and, on the other hand, can lead to national policy approaches which are practical and implementable. This tension between the specific and the generalisable is a central issue in the formation of effective approaches to fuelwood problems, and is considered in depth below.

The arguments set out in this paper draw heavily on several recent publications[2] and collaboration with a number of colleagues, but specific mention should be made of Evan Mercer of Duke University with whom I collaborated on a paper prepared for the World Bank Forest Policy Review.

The approach to fuelwood policies presented here offers real and concrete hope for achieving sustainable change to problems which are complex and often intractable. Such change is contingent on the participation of local communities in planning and executing development projects, which in turn will not happen until a policy environment is created which opens up opportunities for the empowerment of local communities.

These policy reforms are the main focus of this paper. This does not mean that we are not concerned with the formidable challenges which creating effective structures for local fuelwood interventions present; it is rather that all issues cannot be addressed in a paper of this length, and increasingly it appears that the real barriers to effective fuelwood interventions lie

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[2] Much of the content of this paper is derived from recent articles in Energy Policy (Soussan et al 1992a) and Natural Resources Forum (Soussan et al 1992b) and from work in connection with the World Bank Forest Policy Review in 1990-1991 (Mercer & Soussan 1991, 1992).

at the policy, not the project, level. A framework for the analysis of local-level patterns of fuelwood production and use is presented in a sister paper to this one.

The policy focus in turn cannot be approached through a single sector such as forestry or energy. Fuelwood policies which do not achieve an environment for inter-sectoral co-operation will fail; a factor reflected in the poor track record of many past policy initiatives which sought single sector (and often single technology) solutions.

This creates real problems for building a "constituency" for fuelwood policies. There is no natural home for such policies in the traditional ministerial structure of most governments. Fuelwood has tended to slip into the gap between Forestry and Energy Departments, with a situation where either both ignore the issue or, if external funding is available, both claim proprietorial rights over it to the exclusion of the other.

Fuelwood is nearly always marginal; often assigned to special units in either ministry which have little effective clout. This is despite the key role biomass fuels play in both sectors. Throughout Asia fuelwood is both the dominant source of energy and the main use of wood but commercial fuels and commercial timber production dominate the attention of energy and forestry ministries. In this, key ministries such as agriculture (as most biomass fuels come from agricultural lands and are used by farming communities) and finance (who control much of the macro-economic climate crucial to the success of many fuelwood strategies) play no part.

Developing effective answers to fuelwood problems must include both the national and supra-national levels, where broad policy goals are established, and local levels, where the details of implementation projects are worked out. The relationship between these different scales is a key policy issue, as we have found that translating broad policy principles into realisable mechanisms for change at the local level is a challenge which needs a clear analytical process which sets out the actions required at the different scales. This is true for most types of development planning, but is particularly important for issues such as fuelwood, where both the form problems take and the scope for successful interventions are interwoven with other dimensions of the local production system. Combining this local specificity with an approach which involves the local community and does not prescribe the type of intervention chosen (both pre-requisites for effective local planning) contrasts with much of traditional policy-making, which seeks to develop policies and programmes which are applicable over broad swathes of territory.

This paper attempts to offer pointers towards achieving local empowerment through national and international initiatives by presenting an analysis of policy issues associated with the role of biomass as an energy resource. The analysis focuses on the relationship of fuelwood problems to other development issues.

Fuelwood problems are primarily a consequence of the interaction of environmental and economic forces at a local level (Soussan 1988, Munslow et al 1988, Agarwal 1986). These result in a series of resource stresses of which fuelwood is but one (Soussan 1991a, Leach and Mearns 1989, Blaikie and Brookfield 1987). These stresses are highly localised, as are opportunities for addressing them. Just as there is not one fuelwood problem there are many potential solutions. The key is to identify what will work where and why. It is from this basis that solutions which reflect local circumstances can be built.

Interventions which operate at a local level will be doomed, however, in the absence of an appropriate policy environment. This policy environment must create the circumstances in which the following set of goals can be realised:

1) It must empower local communities to have effective control over their local resource base, and especially over land and biomass resources, as it is from this that improved management of these resources will stem.

2) It should create an economic and political environment conducive to local empowerment and the sustaining of local solutions. The external policy environment frequently undermines local initiatives, however well-intentioned these may be. Policy-makers must create a climate which will nurture and support the local-level changes needed if fuelwood stress is to be alleviated and these vital resources managed in an efficient and sustainable manner.

3) Fuelwood policies must provide effective external support to ensure the availability of deficient material and technical inputs for local-level solutions. This is a direct role in the implementation of fuelwood interventions, in which an effective partnership is built between the resources and knowledge of the local community and those of outside agencies.

The creation of such a policy environment is a challenging proposition; "putting the last first" (to quote Chambers, 1983) cannot happen overnight. In most countries it will not happen at all until a series of fundamental policy reforms are introduced. Such policy reforms are an essential pre-condition to finding local answers to fuelwood problems; an issue which we discuss in greater depth in the next section.

2. HOUSEHOLD ENERGY, FUELWOOD USE AND SUSTAINABLE DEVELOPMENT

The context of energy policy (including fuelwood as a sub-set) has changed in recent years to focus on how energy contributes to sustainable development (Soussan 1991a, O'Keefe and Munslow 1988, Leach and Mearns 1989). The central issue is not how to supply more energy (in whatever form), but rather how to ensure that the energy needs of sustainable development paths are met in the most effective manner. For energy, the key is to define energy need, not resource availability; a perspective which calls for a reassessment of the 'resource scarcity' paradigm which dominated in the 1970s and early 1980s, but which the abundance, in the medium term at least, of fossil fuels now makes redundant (Foley 1987, Odell 1986).

We must have a clear understanding of the meaning of sustainable development. The Brundtland Report defines sustainable development as: "development which meets the needs of the present without compromising the ability of future generations to meet their own needs". It is a call for policies which maximise growth without jeopardising the position of vulnerable people or depleting the future viability of the resource base.

Sustainable energy policies will have some distinctive characteristics. They encompass a long-term time horizon, in which needs are assessed and resources valued in relation to a development path based on lasting and secure patterns of growth and change. Real tensions exist between these long-term development goals and short-term economic necessities; tensions which are vividly illustrated by the problems caused by the impact of the oil crises of 1973-4 and 1979-80 on the economies of First and Third World alike. Resolving these tensions is a pre-requisite for establishing the long-term vision needed to achieve sustainable change.

A key ingredient is to correctly value the environment and treat it as a central factor in policy formulation (Pearce et al 1989, Barde and Pearce 1991, Barbier 1989). The real cost of different forms of energy need to be assessed, and in this the true worth of environmental stocks, flows and sinks must be assessed and accounted for. To achieve this it is necessary to correctly price different fuels, to take account of these costs in investment decisions and to recognise that development is about more than simple economic growth. The quality of life and the maintenance of the environment are as important policy goals as the growth of per capita GNP.

Sustainable development approaches are based on the need to reduce inequalities in both current livelihoods and future prospects. Development policies must strive to meet the needs of all sections of the community as a goal which stands alongside, or even takes precedence over, increased production and enhanced economic growth. Growth which excludes the disadvantaged can be attractive in the short-term, but will accumulate problems and injustices and will rarely be sustainable in the long-term. This is particularly true for sectors, such as fuelwood, where our concern is with resources which can be exploited for short-term benefits which ultimately destroy the resource base, or can be utilised in ways in which some short-term benefits are sacrificed for retaining the long-term integrity of the resources.

This goal of meeting the needs of the more disadvantaged gives rise to the final characteristic of sustainable development policies: the recognition of the need to devolve control over resources and over decisions on development paths as widely as possible. The value of local communities' knowledge of their problems, priorities and potentials for development is now widely recognised (Richards 1985, Conway and Barbier 1990). Communities need to be given the power to influence the decisions which affect their lives, and in particular the global community must strive for development paths which allow local people greater control over the physical, financial and environmental capital on which they depend.

These principles of sustainable development provide a set of policy guides against which specific policy initiatives should be judged. They are not rigid criteria, and one of the key tasks of the policy maker is to find an effective balance between the complex and often contradictory impact of individual policy options on these principles. This means that the formulation of policy should be a flexible, consensual process in which as wide a level of consultation as possible is undertaken.

There are, of course, practical limits to such a process and policy formulation should not be a hostage to fortune to any one particular set of vested interests. It should, however, take account of the full range of effects of the policies developed if much of the recent rhetoric about sustainable development approaches is to be turned into a reality of sustainable change. The rest of this paper outlines a series of fuelwood policy options which recent experience suggests would go far towards achieving these goals.

3. AN OVERVIEW OF FUELWOOD POLICY OPTIONS

Most governments and donor agencies have only paid attention to fuelwood as a planning issue during the past 15 years or less. During this time, the main approach has been to view the fuelwood "crisis" as an energy demand and supply problem. Both diagnoses of problems and designs for solutions have been premised on simple models of supply and demand "gaps". Viewed from this perspective, answers were self-evident: if projected demand outstripped potential supplies either shift the supply curve outward by planting more trees or

move the demand curve inward by reducing demand through conservation. Both approaches are essentially technology-focused (whether forestry or stove technologies), and with a few notable exceptions these efforts have failed to have a lasting impact on fuelwood scarcity, whether real or predicted. The failure of such technology-focused attempts has been documented in O'Keefe and Munslow (1988), Leach and Mearns (1989) and other sources.

The frequent failure of many such policy initiatives has led to a re-appraisal of the fuelwood crisis. A number of key studies (see, for example, ETC 1987, Leach and Mearns 1989, Soussan 1988, Munslow et al 1988) argue that biomass fuel production and use are intimately integrated into broader processes of resource management in local production systems. Fuelwood problems are best understood to emerge gradually, as people respond to a variety of resource stresses. This means that fuelwood stress rarely manifests itself as a simple shortage of fuel (Soussan 1988, Mercer and Soussan 1991, O'Keefe and Munslow 1988).

The causes of these stresses are rooted in more fundamental failures in rural land, labour and capital markets and urban energy markets. They also reflect the failure of local and national governments (often in collusion with donor agencies) to establish the conditions which would allow efficient and sustainable allocation of land and resources between woods and cropland, food and wood production. This issue of the distribution of control over decisions concerning land, finance and other resources lies at the heart of effective fuelwood policies, but has rarely been recognised as a matter for legitimate concern for fuelwood policy makers.

Land tenure in particular is of crucial importance (Soussan 1991b). All too often, those at the sharp end of fuelwood stress are distinct social groups (especially women and/or landless labourers) who have little control over decisions concerning land management or use (Soussan et al 1991). Fuelwood stress hits the poor and powerless first and hardest, but it precisely these groups who have the worst access to the main resource, land, needed to effectively confront this stress.

Although the activities undertaken in any fuelwood strategy will vary according to local conditions, in general policy interventions should seek to ensure the following:

1) To secure property rights, and especially to ensure the rights of those groups experiencing the worst problems over access to biomass resources. This should include customary and communal rights as well as private property rights.

2) To improve access to and the management of local land resources, including actions to remove factors which limit the access of local people to communal or state lands alongside the provision of knowledge and inputs to enhance the quality of existing land management practices.

3) To improve market functions by eliminating policy-induced distortions, internalize externalities through pricing policies and reduce uncertainties through more stable and predictable policies. These policies are particularly important where, as is normal in cities and increasingly common in some rural areas, biomass fuels are partly or wholly commodified.

4) The voice of the community should be to the fore, and effective institutional structures to give the actors on the ground a real level of control over the decisions which affect their lives need to be developed.

Along with this process of policy reform and institutional development, specific fuelwood sector strategies should be developed, accompanied by the further strengthening and reform of fuelwood planning institutions to create an effective implementation capacity.

From this set of goals, four inter-related general policy directions can be identified:

* Improve the information base on which policies are developed.
* Correct market failures and improve the functioning of markets.
* Develop fuelwood sector strategies.
* Strengthen fuelwood planning institutions.

We shall now consider each of these policy directions in more detail.

4. IMPROVE INFORMATION

This is an essential first step, given the variety and complexity of fuelwood and other household energy systems. The "tool kit" of conventional energy (or forestry) planning is not well suited to planning in this area, and many of the policy mistakes of the past have reflected a fundamental failure to understand the dynamics of biomass fuel production and use (Leach and Mearns 1989, Mercer and Soussan 1991). These policies have too often been based on highly aggregated data and ill-informed assumptions about the forces driving biomass fuel production and use.

Effective monitoring is even rarer, and in most cases the available information does not allow accurate (or even crude) assessment of likely future mixes of modern and biomass fuels, nor the economic benefits and costs associated with different forms of fuel provision and consumption. Among the most pressing information needs are better data on household energy use, on fuelwood markets, on the fuelwood resource base and on tree and woodland management systems.

Much has been written about how households respond to energy scarcity and which factors are important in influencing their fuel choices, but little empirical information exists. A number of household surveys have been undertaken, but most are census-type "snapshots" of one point in time. These are notoriously poor at providing insights into processes of change, the specific character of localised fuelwood production and use, or subtle, non-quantitative interactions between people and their resource base. Longitudinal data on patterns of fuel use and rigorous estimates of demand and supply elasticities are almost non-existent.

We can have little confidence in our predictions on how households will respond to changing fuelwood situations until this sort of information is available. Fuelwood policy interventions will be haphazard until we can understand and more confidently predict how households will respond to changing fuelwood circumstances. Successes may occur, but these will be more by luck than judgement.

In-depth surveys of household fuel markets (for both modern and biomass fuels) are needed to ascertain how fuels are produced, distributed, marketed and priced, how the economic cost of different fuels is built up and which stages in the marketing process are most susceptible to policy interventions. This is critical for urban areas and rural areas where fuels have become commoditised, as policy-makers interfere in markets they do not understand at their peril. In addition, information is needed on land, labour, agricultural and forest products

if the relationships between biomass fuels and the wider production system are to be understood.

Although commercial fuelwood is creating severe environmental stress in many areas (see Soussan et al 1990 for a fuller discussion of this issue), it is a mistake to assume that commercialised fuelwood is a priori a problem. In other regions commercial fuelwood can be and is produced on a sustainable basis, providing an important source of income for rural households and saving considerable sums of foreign exchange. The key policy issue is how to manage the resources on a sustainable basis. This cannot be achieved without a better understanding of fuelwood market processes.

We have very little reliable information on the fuelwood resource base, and in particular know little about sustainable off-take levels from different land formations. A critical information gap concerns trees and shrubs outside the forest, in the agricultural landscape, which are often the main sources of rural fuel. Detailed surveys which measure the biomass resource base as a whole (and not just commercial timber in forests) should be a priority action for forestry institutions. The monitoring of changes in the distribution and quality of biomass resources is needed in the long-term; monitoring which requires a level of institutional commitment which is difficult and expensive, but which is nevertheless needed.

Woodland and tree management systems are the starting point for good policy, as they are the basis upon which community-based interventions will be built, and yet we know little about how local people manage their land resources in most regions. Such systems are based on a detailed understanding of local environmental conditions, and reflect a reservoir of local knowledge which we have yet to tap.

Local resource management systems are best understood through long-term, participatory studies which seek ways to forge a partnership between Western science and people's knowledge. These studies also provide a basis for building trust between local people and outside institutions and for exploring the most effective structures for creating a local implementation capacity for interventions to sustain and improve the resource management systems.

This sounds like a bottomless pit of research expenditure, but approaches which combine rapid appraisal field techniques with data from remote sensing sources can produce surprisingly good results quickly and relatively cheaply. They can be repeated periodically to assess processes of change. These can also form the basis for acquiring these longitudinal data through the effective monitoring of interventions, rather than establishing separate data collection systems.

5. CORRECT MARKET AND POLICY FAILURES

The next step in formulating fuelwood policies is to identify the underlying causes of fuelwood problems in specific localities. Past fuelwood policies have all too often been based on the observable symptoms, rather than the underlying causes of the problem. Economic manifestations of fuelwood stress often reflect market and policy failures that produce situations in which benefits are disassociated from costs, prices from scarcity, rights from responsibilities and actions from consequences. For example, open access forests allow wood producers to shift the costs of over-exploitation onto future generations. Similarly, policies which distort prices act as dis-incentives to improved efficiency and conservation, and result in fuel mixes which are clearly undesirable.

The key market and policy failures are inappropriate property rights, incorrectly priced resources, policy-induced price distortions in capital, labour and commodity markets and over-valued currencies. Let us consider each of these in turn.

Property rights need to be clear, secure and enforceable. Ill-defined, attenuated, unenforceable or absent property rights are a barrier to effective local management of biomass resources and lead to fuelwood problems as one dimension of wider resource stresses. Resolving land tenure insecurities is an essential pre-requisite for effective fuelwood (and wider development) policies (Soussan 1991b, Shepherd 1988, Acharya 1989, Armitage and Schramm 1989). Whether this is through privatisation, strengthened communal management, land reform or other approaches will depend on local circumstances. A dogmatic adherence to one approach will be self-defeating. Whatever route is taken, property rights problems should be resolved before most technical options can be implemented .

Valuing and enforcing economic prices for biomass resources are problematic. This is especially true when dealing with communal resources. Reforming policies which distort markets and resolving property rights, whilst not a complete answer, will go far to producing prices which reflect the true costs of resource exploitation. Collecting stumpage fees is difficult, but may be possible where an effective Forest Department has control over a clearly-defined area of forest. Similarly, the demand end can be addressed through ensuring the availability of competitively-priced alternative fuels such as kerosene. In other areas, effective control of wood resources by the local community is the basis for achieving prices which reflect the total value of these resources, so long as their exploitation is managed on a sustainable basis.

Many policies outside the energy sector also lead to fuel price distortions. Relative tax and subsidies on different fuels rarely reflect a considered analysis of the development of a coordinated energy policy. All too often they are a political football, and tend to be biased towards the interests of urban-based elites. Similarly, access to capital for investments in small-scale, dispersed energy systems has been constantly sacrificed to large, centralised investments, with the electrical power sector dominating.

The widespread underpricing of rural products (especially foodstuffs) has tilted development towards the urban sector, resulting in the undermining of the rural production systems within which woodfuels are produced. The resultant increases in rural-to-urban migration flows produce serious labour shortages for rural production and maintenance of the rural landscape. In some regions, the drive towards the short-term extraction of profits from rural resources (often in a desperate bid to maintain foreign exchange earnings in order to service debts) leads to a bias towards monoculture of cash crops, the unnecessary clearance of woodlands and forests and the unsustainable exploitation of land resources which are the main source of fuel (and other needs) of the rural poor.

These and many other forms of policy distortion appear at first glance to have little to do with fuelwood problems, but are key factors in the processes of change which lead to the deterioration of the resource base. There is little scope for introducing effective fuelwood interventions whilst such distortions exist.

6. DEVELOP FUELWOOD SECTOR STRATEGIES

Providing better information and reforming market and policy distortions will create the pre-conditions for establishing effective fuelwood policies. Such policies need to be coordinated through fuelwood sector strategies which are able to capture the local specificity of fuelwood problems and opportunities. This will determine the appropriate mixes of technical packages across supply enhancement, conservation and fuel switching options. It will also provide a structure for prioritising efforts and the institutional relationships between planning agencies and local communities.

Again, the central message is that simplistic, prescriptive technical fixes must be avoided and policies which integrate fuelwood problems with the management of the wider production system developed. Assessing the suitability (in economic, social and environmental terms) of technical alternatives to local and regional conditions should form the starting point for interventions designed in the strategic planning exercise. The management of existing fuelwood supplies, supply enhancement through increased production, demand management through conservation strategies, fuel switching policies and a range of measures to improve the efficiency of fuelwood use all have merits and disadvantages.

Fuelwood interventions must be rooted in local circumstances through a structure developed within an effective fuelwood strategy. Many countries will need external support to develop the capability for designing and implementing such fuelwood sector strategies, as this task necessitates both levels of resources and expertise not readily available to fuelwood planning institutions. This support can and should come from the international donor community, who are able to mobilise the resources and expertise for such initiatives.

7. STRENGTHENING FUELWOOD PLANNING INSTITUTIONS

The actions outlined above will go far to establishing where fuelwood problems are and how they should be addressed. This is of no more than academic interest, however, if local institutions lack the capacity to implement the strategy. This is clearly the case in many places; in part reflecting the inherently cross-sectoral nature of fuelwood issues. This problem of coordination between different agencies is exacerbated by the lack of effective channels for the involvement of local people in the planning and implementation process.

The following basic principles are suggested for institutional reform:

1) They should be responsive to energy needs/demand. This requires an end-use approach in which energy production capabilities are driven off defined needs with no pre-definition of technical choices and flexibility over timing of interventions.

2) They need to create effective channels for the participation of fuelwood users and providers in the planning process, allowing effective bottom-up participation in all stages of planning.

3) They should permit multi-sectoral cooperation. Energy and forestry ministries will continue to take a lead role in the planning process, but other institutions may be the most appropriate executing agency.

4) The principles of sustainability, in environmental, economic and institutional terms, should be fully integrated into the procedures of energy planning institutions.

5) The role of the state as a facilitator means that effective decentralisation, in which control over local resources is given to local communities, is required.

6) Positive action to create effective management structures and enhanced management skills is needed to counter the negative impact that poor capacity in this field produces.

7) The role of external donors also needs re-evaluation to ensure that their operations facilitate the creation of sustainable planning procedures.

8) Fuelwood planning should be more flexible, seeking indirect strategies and building a partnership between local people and planning institutions.

As such, an improved institutional capacity is needed at local, national and international levels if the broad principles for fuelwood planning outlined here are to be translated into effective action. Although movement in this direction has begun in recent years, these initiatives need to be supported and built on; a process to which this paper is intended to contribute. Central to this is capturing the diversity and dynamism of local fuelwood situations. The different stages of fuelwood policy development outlined above form a starting point for the process of institutional development.

8. CONCLUSIONS

This paper provides an overview of fuelwood policy issues and demonstrate how such policies can begin to be contextualised to local circumstances. The approach outlined here is intended as no more than a starting point for effective planning, in that it provides pointers for action. Even so, it is clear that developing fuelwood policies is a messy, complex process, and the one-dimensional, technical blueprint approach which has characterised so much development planning in the past is doomed to ignoble failure.

Such lessons must be learnt by planning institutions. The need to create the pre-conditions for planning must be accepted and acted upon if we are ever to see real, sustainable solutions to the fuelwood problems which have been graphically described for so long. If this happens then much can be accomplished, but without such change further discussion of the relevance or otherwise of different technical options serves little useful purpose. As is so often the case, effective fuelwood policies are more about building structures than introducing technologies or planting trees.

9. REFERENCES

ACHARYA, H. "Jirel property arrangements and the management of forest and pasture resources in highland Nepal" Development Anthropology Network, (1989), Binghamton, Institute for Development Anthropology.

AGARWAL, B. Cold hearths and barren slopes (Zed Press, London, 1986).

ARMITAGE, J. & SCHRAMM, G. "Managing the supply and demand for fuelwood in Africa" in Schramm, G. & Warford, J. (Eds) Environmental management and economic development (John Hopkins Press, Baltimore, 1989) pp. 139-171.

BARBIER, E. (1989). Economics, Natural-Resource Scarcity and Development London, Earthscan.

BARDE, J-P. & PEARCE, D. (1991) Valuing the environment London, Earthscan.

BLAIKIE, P. & BROOKFIELD, H. Land degradation and society (Methuen, London, 1987).

CONWAY, G. & BARBIER, E. (1990). After the Green Revolution London. Earthscan.

CHAMBERS, R. (1983) Rural development: putting the last first Longmans, London.

ETC. 1987. SADCC Fuelwood Study. ETC Foundation, Leusden, The Netherlands.

FOLEY, G. (1987). The Energy Question (3rd Edition), Harmandsworth, Penguin.

LEACH, G. AND MEARNS, R. 1989. Beyond the Woodfuel Crisis: People, Land, and Trees in Africa. Earthscan Publications, Ltd. London.

MERCER, D.E. AND SOUSSAN, J. (1991) Fuelwood: an analysis of problems and solutions for Less-Developed Countries World Bank Forest Policy Review Background Paper, World Bank, Washington D.C.

MERCER, D.E. & SOUSSAN, J. (1992) "Fuelwood and forestry policies in Developing Countries" in Sharma, N.P. (Ed, 1992) Managing the World's Forests Kendall/Hunt Publishing Co., Dubuque, Indiana

MUNSLOW, B. et al 1988. The Fuelwood Trap. Earthscan, London.

ODELL, P. (1986). Oil and World Power (8th Edition) Harmandsworth, Penguin.

O'KEEFE, P. AND MUNSLOW, B. 1988. Resolving the irresolvable: the fuelwood problem in Africa. In: Proceedings of the ESMAP Eastern and Southern Africa Household Energy Planning Seminar. World Bank. Washington. D.C. pp.25-50.

PEARCE, D., MARKANDYA, A. & BARBIER, E. (1989). Blueprint for a Green Economy London, Earthscan.

RICHARDS, P. (1985) Indigenous agricultural revolution Hutchinson, London.

SHEPHERD, G. 1988. The reality of the commons: answering Hardin from Somalia ODI Social Forestry Network, Paper 6d.

SOUSSAN, J. (1988) Primary resources and energy in the Third World Routledge, London.

SOUSSAN, J. (1991a) "Building sustainability in fuelwood planning" Bioresource Technology vol35, pp 49-56.

SOUSSAN, J. (1991b) Philippines household energy strategy: fuelwood supply and demand report to the World Bank Industry and Energy Department, May 1991.

SOUSSAN, J. et al 1984. Fuelwood strategies and action programmes in Asia. AIT, Bangkok.

SOUSSAN, J. et al (1990) "Urban fuelwood: challenges and dilemmas" Energy Policy vol 18, no 6, pages 572-581.

SOUSSAN, J. et al (1991) "Planning for sustainability: access to fuelwood in Dhanusha District, Nepal" World Development, vol. 19, no. 10, pages 1299-1314.

Wood Energy Health Effects in Developing Countries

by

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1. INTRODUCTION

In contrast to developed countries, most biofuel in developing countries is used in households, which are the principal focus of this chapter. Small-scale commercial and industrial activities, however, also utilize biofuels in many areas. Although there are few studies that focus specifically on their health and safety factors, these non-household uses can be expected to have many of the same dangers as accompany the use of biofuel domestic stoves. In some cases, of course, these activities take place near or within the household, or even on the same stove that is used for cooking and space heating. The fe large-scale uses of biofuels in developing countries have similar impacts as those discussed elsewhere in this volume.

While there are many anecdotal accounts linking village stoves to burns, fires, and lung and eye problems, few systematic studies have directly addressed these issues. This is partly because of the difficulties of doing such research in a scientific manner and partly because of a lack of concern in the scientific and medical establishments that conduct such work. This lack of concern was not without some justification in the past. As with other traditional foams of hazard such as water contaminated by human waste, there may have seemed to be little argument about the need to eliminate the fire and smoke hazards characterizing decentralized biofuel use in less-developed regions. Since in the past there has been a natural evolution away from open biofuel-fired stoves during economic development, it may thus have seemed unnecessary to spend much effort to characterize the health effects that were, in any case, on the way out.

The changes in relative fuel costs and availabilities characterizing the 1970s, however, led to different perceptions of the evolution of domestic energy use. It is now thought that biofuels may well have a relatively long future in a large percentage of the world's households. There are a number of implications of this view. The most obvious is that in most areas the biomass fuel cycle will have to change. Managed production must replace the unmanaged "hum-and-gather" techniques relied upon for harvesting most household fuels. In addition, to serve development as well as survival needs, there will be need for a greater degree of upgrading to higher quality fuels such as charcoal, gases, and alcohols. Finally, of course, the fuel cycle must end with devices that achieve higher efficiencies if biofuels are both to be harvested on a sustainable basis and to continue to meet household fuel demands (Smith 1987a).

There are also implications for health and safety. No more can it be expected that existing problems will go away by themselves. They must be directly addressed at each step of the fuel cycle. Because there may well be difficult trade-offs among the desired for economy, efficiency, cleanliness, safety, and other characteristics, increased qualification of the impacts will be required to make rational choices.

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[1] EWC, ESMAP, World Bank, U.S.A.

Such factors as economy, efficiency, and to some extent, safety are fairly easily perceived by the users themselves. It can thus be argued that, given the opportunity, users are best qualified to choose among alternatives in a way that best serves their own interests. Environmental contaminants, however, present a more difficult problem. Their impacts are often delayed and otherwise difficult to link directly to exposures. Indeed, some of the most damaging pollutants cannot be perceived at all by human senses. Neither are the health effects easily distinguishable from those with other causes. Thus, to pin down effects, it is necessary to rely on instrumentation, statistical judgements, and expert opinion. This is sometimes even true when the effects are great, as they are, for example, with tobacco smoking.

2. DIRECT IMPACT ON HEALTH

The most direct impacts on health relate to fires, burns, and air pollution exposure resulting from household use of biofuel-fired stoves.

2.1 Air pollution

A direct answer to the question about air pollution effects from decentralized use of biofuels is not yet possible because so little direct work has so far been done. It is possible, however, to break down the question into a series of subquestions that can be partially answered and, taken together, give some indication of the extent of the problem. Figure 12.1 shows the framework within which the components can be linked.

2.2 How widespread is biofuel usage?

Biofuels is the most important household fuel in the world. As has been true since the discovery of fire, most people rely most of the time on such fuels for household energy needs. While it is difficult to be precise and there are many local and seasonal variations, it seems that the vast majority of such use occurs in open stoves that do not vent the smoke away from the user.

2.3 How much smoke is produced by biofuel combustion?

Unlike many fossil fuels, most biofuels contain few contaminants that cannot, in principle, be converted to non-toxic products during combustion. Indeed, in some circumstances biofuels can be burned with little smoke production, but unfortunately, it is quite difficult to do so in simple small-scale stoves (that is, of less than 10 KW, or using about 2 kg of wood per hour). Instead, a wide range of pollutants are normally emitted in several major categories: carbon monoxide, particulate, hydrocarbons, and nitrogen dioxide (table 12.1). The rate of production is generally substantially higher than with the combustion of gaseous or liquid fuels and is only rivalled by burning of other high-volatile solid fuels such as coal.

2.4 How dangerous is biofuel smoke compared to that from other fuels?

Biofuel smoke, like tobacco smoke, contains hundreds and probably thousands of individual carbon-containing chemicals, many of which have been shown to be damaging to health in either human or animal studies. These include potentially cancer-causing polyromatic hydrocarbons (such as benzo(a) pyrence), aldehydes (such as formaldehyde), and aromatic (such as benzene). In addition, the size of the particles is such that they can penetrate deep into the lungs where it is thought the most damage can occur. Laboratory studies show that, gram for gram, wood smoke seems to have about the same potential for producing tumors as smoke from the burning of tobacco or vehicle fuels. This contrasts, for example, with the smokes from certain coals that seem to have much greater activity (lewlas 1986).

2.5 How much smoke are people exposed to?

Only a small number of studies have been done in which actual exposures have been measured. Indeed, it has only been in recent years that the techniques and equipment for such studies have been developed, largely in response to the growing concern about indoor air quality in developed countries. Moreover, only a limited number of geographic and social conditions, fuels, stoves, house types, and time periods have been studied in developing countries in spite of the large population potentially at risk. No standard methods have yet been developed. For example, most measurements have been done by stationary monitors, rather than by personal monitors that are actually worn by the householders. Since there are wide variations of smoke concentration in different parts of the house at different times, it is difficult to determine actual human exposures from such measurements.

Table 12.1 Comparison of air pollutant emissions per unit delivered energy[a]

Fuel (Efficiency)	Fuel equivalent to one million MJ delivered	Particu lates	Sulphur oxides	Nitrogen oxides	Hydro carbons	Carbon mono-xide
Industrial (>20 kW)						
Wood (70%)	89 t	500	53	400	400	450
Bituminous (80%)	43 t	2 800	820	320	22	45
Residual oil (80%)	33 000 t	94	1 310	240	4	20
Distillate oil (90%)	31 400 t	8	1 120	83	4	19
Natural gas (90%)	28 200 m^3	7	neg.	99	2	8
Residential (<5 kW)						
Heating stoves						
Wood (50%)	130 t	2 700	30	100	6 800	17 000
Anthracite (65%)	49 t	46	200	250	100	1 000
Bituminous (65%)	53 t	550	1 100	270	530	5 300
Distillate oil (85%)	32 900 t	11	1 170	71	4	20
Natural gas (85%)	30 000 m^3	7	neg.	38	4	10
Cooking Stoves[b]						
Tropical wood (15%)	420 t	3 800	250	300	3 200	34 000
Hawaiian cow dung (15%)	530 t	10 000	3 200	7	?	44 000
Indian coal (20%)	220 t	280	2 200	460	2 200	27 000
Coconut husk (15%)	480 t	17 000	?	7	7	54 000
Natural gas (80%)	32 000 m^3	0.5	neg.	10	5	250

a List in kg of pollutant per TJ delivered. These are typical but not average figures. Actual efficiencies and emissions depend on fuel qualify and combustion conditions. Residential heating stoves under US conditions. Biomass and coal cooking stoves under rural Indian conditions - no .....

b Wood at 15% moisture (db) - 16 MJ/kg; bituminous coal at 10% ash 1% S - 29.2 MJ/kg; anthracite coal at 0.2% S - 31.5 MJ/kg; Indian coal at 0.5% S- 23 MJ/kg; Hawaiian cow dung at 0.3% S and 15% moisture - 12.5 MJ/kg; coconut husk at 15% moisture (db) - 14 MJ/kg.

In general, where open combustion occurs indoors, such measurements have found high levels of particulate and some of the limited number organic compounds that have been measured. Typical concentrations greatly exceed those in any but the dirtiest urban outdoor environments. Maximum levels exceed anything measured in cities. Carbon monoxide and nitrogen dioxide levels are often above the standards set to protect public health, but except very near the fire, not to the extent demonstrated by particulate and organic compounds. Compounds that have caused cancer in animals and arc known to be in mixtures that cause cancer in humans (such as tobacco smoke and coal tar) have also been found at extremely high levels compared to urban situations (Smith 1987a).

Since people spend a considerable amount of time indoors, exposures as well as concentrations can also be high. It has been difficult to demonstrate strong associations of exposures with household parameters such as volume and area of window, but roof type does seem to have an effect as well as the proximity to nearby houses (Menon 1988). Statistical tests tend to show greater exposure variation within homes than between homes with the same stove and fuel characteristics (WHO 1987a). In general, however, people in households at higher elevation will have higher exposures because of tighter ventilation conditions and the increased use of the stove for space heating (Dary et. al 1981).

2.6 What health effects would be expected, and which have been found?

Based on studies of the same compounds but in different mixtures, populations, and exposure patterns (that is, cities, occupational settings, and tobacco smoking), there are five major types of health effects that might be expected from such exposures (Smith 1987a):

1. *Acute respiratory infections (ARI)*: The most conclusively demonstrated health effect of passive tobacco smoking is the increase of ARI in children (USNRC 1986). In village houses, however, typical exposure to most pollutants greatly exceed the levels resulting from passive smoking exposures in developed countries. Preliminary studies in rural Nepal have shown a relationship between hours per day spent near the stove and the incidence and severity of ARI among very young children (Pandey 1985). A study in Papua New Guinea failed to find a relationship for school-age children (Anderson 1978).

   It is quite important to understand this connection since ARI is now one of the principal causes of illness and death among the world's young children, then exceeding diarrhoea in many estimates. As many as one-third of the world's childhood deaths can be attributed to ARI (Leowskit 1984). There are a number of risk factors for ARI of which smoke exposure may be important in some regions (WHO 1987b).

2. *Chronic obstructer lung diseases (COLD):* Chronic bronchitis and other forms of COLD have been associated with long-term exposures to air pollution of various kinds, including active tobacco smoking. Preliminary studies in Nepal (Pandey 1984) and India (Padmavati and Amora 1976) have shown, for women, an association of COLD and associated heart problems with cooking, while other studies in Papua New Guinea have led to conflicting results (Smith 1987a). Such studies are difficult to interpret, however, because of the need to determine the history of exposure over many years.

3. *Low birth weight:* Evidence from both active and passive smoking studies indicates that the pollutant exposures to pregnant women in village households may be sufficient to be a factor along with nutrition and other influences in low birth weight. Low birth weight, of course, is highly .... with infant mortality and lifelong disability, and is a serious

problem in developing countries. No studies of the impact of household smoke, however, seem to have been done.

4. *Cancer:* There seems to be little concrete evidence of excess cancer from biofuel smoke although such smoke contains a number of suspected carcinogen. In the past, some studies in Kenya and among various populations of southern Chinese have pointed to nasopharyngeal cancer, but more recent analysis has played down the role of smoke (Smith 19...a). Age-adjusted lung cancer rates are generally thought to be low in those areas of the world with high biofuel smoke exposures although no systematic studies of the connection seem to have been done. Recent evidence from China does point to a possible impact but not nearly to the same extent as the effects of smoke from the local coal burned in the village stoves (Mumford et al. 1987). The impact of biofuel smoke exposures on cancer remains elusive, although can probably be said not to be large, in spite of large theoretical risks based on extrapolations from other known carcinogenic mixtures such as tobacco smoke. As life expectancies lengthen, however, cancer, which is mainly a disease of the old, with become more prominent. If biofuel smoke exposures persist to that time, the impact on cancer rates may be more critical.

5. *Eye problems:* While anecdotal accounts of eye problems related to smoke are common, there seem to be no systematic studies of the problem.

Although the existing studies referred to above are suggestive, no epidemiological study has yet been done that actually measures both health outcomes as well as smoke exposures. Neither have any before and after (intervention) studies been done to determine the health improvement resulting from exposure reduction measures such as the introduction of improved stoves. Clearly, however, such studies are warranted given he large exposures, large population, and preliminary results of the semi-quantitative studies done to date. Easiest will be studies of ARI and low birth weight, in which exposures and outcomes are most closely connected in time. The wide variation in household exposures argues for utilizing a control group that is similar in all respects except smoke exposure. This is difficult in practice because so many cultural and economic parameters also correlate with smoke exposures. The best approach, therefore, is to employ studies designed to produce their own control group through intervention (Pandey et al. 1989).

2.7 Fires and burns

Safety clearly plays important roles in user perceptions of household stoves and fuels. In the Terai (lowlands) of Nepal, for example, the introduction of improved stoves with flues has reportedly been hampered because of the increased perceived risk of roof fires started by sparks from the flues. An often mentioned advantage to improved stoves, on the other hand, is that they are less likely to burn young children who many bump into them. This results partly from the enclosure and, sometime,s insulation of the combustion chamber, and partly from the raising of the stove from the floor and more firmly secured pots making spillage of hot food less likely (Sefu 1987). A further important safety advantages accrues in those parts of the world where tragic a often fatal fires of women's clothing occur (Raggett 1987).

3. INDIRECT IMPACTS ON HEALTH

Other impacts on health indirectly attributable to the use of biofuels in simple open stoves. Some, like human exposures to smoke, are negative, but others may be positive.

3.1 Inefficiency and fuel shortages

A set of interconnected problems relate to the domestic biofuel cycle those many parts of the developing world where harvesting is done household members. As has been documented by many authors[1]. The time spent in the combined efforts of harvesting and cooking often ..... a significant fraction of the day. In addition, the decreasing availability of biofuels in many areas has resulted in an increase and sometimes shift in the relative duration of these tasks because of greater distance that must be travelled to obtain fuels and the decline in the average quality of fuels - which tend to increase the net weight of fuel to be carried and the cooking time (as well as smoke production). This created several kinds of health-related problems[2].

* The inefficient use of women's working time, reducing the ..... spent on family care and income-generating activities.

* The appropriation of children's time that might otherwise be occupied in more productive or educational pursuits.

* Pressure on cooking patterns, leading to practices that may low nutritional status such as reducing the number of meals per day, type of food preparation, the thoroughness of cooking, or the kind food cooked.

* Women and children may be encouraged to shoulder physical loan of an unhealthy size and quantity.

* Additional food energy is required for the least well nourished family members - women and children.

* The loss of household income-generating opportunities from food preparation and other fuel-using enterprises may result. Studies have shown that, particularly when came by women, such income often important in maintaining family nutrition and access to health care.

* Household income may be lowered by encouraging use of more expensive pre-prepared foods (as well as purchase of alternative fuels).

* Water-boiling, clearing, bathing, and other activities necessary to maintain a sanitary home may be discouraged.

* The risk of increased rates of malaria, infections from injuries and parasites (such as leeches), or victimization by crime of women and children forced to forage in marginal areas.

* The possibility of decreased efficiency and increased ill-health resulting from inability to heat homes properly in upland or temperate areas.

* Male migration may be encouraged, leading to an increase in the already usual double burden on women (home and farm). Indeed, one study has linked local environmental deterioration to female suicide (Agarwal 1986, p.24).

3.2 The health benefits of smoke

Anecdotal accounts of the benefits of household biofuel smoke are nearly as common as those describing ill effects. As indicated in figure 12.1, an analysis of the overall interaction of smoke exposure and human welfare should take these factors into account. Unfortunately, however, it seems that once again few if any systematic studies have been done to verify and quantify these benefits.

The most important benefit ascribed to such exposures is mosquito repellence. Certainly, with the rise in malaria occurring in some parts of the world along with pesticide and drug resistance, such a benefit needs to be carefully considered (Sloof 1987). As with the other aspects of the overall problem, however, the absence of scientific interest has meant that there are no standard methods available to test the effects of smoke on mosquito behaviour. The work that has been done to develop such a method has not been yet applied to malaria-carrying mosquitoes. Preliminary results seem to show that effective mosquito repellence can occur at smoke concentrations substantially below what is often found in village houses (Jelich 1987).

These early results are consistent with evidence from interviews with village women who have adopted improved stoves with flues. They report the ability to continue mosquito repellence by burning small amounts of specific local biomass forms such as neem leaves (Grainge and Ahmed 1988). This is analogous to the use of a mosquito coil, which results in much lower concentrations of smoke but releases compounds of particular impact on mosquitoes. Again, however, while there is a substantial amount of anecdotal evidence, more systematic research would be needed to pin down these relationships with confidence.

The second most commonly noted benefit of smoke is preservation of household thatch. Again, although certainly amenable to experimental validation, only anecdotal evidence seems to be available at present. Neither is this evidence consistent: many surveys indicate that villagers actually perceive little such advantage to smoke, or point out that fumigation with smoke can be done in ways that minimize human exposures, or describe the negative impacts of smoke on household materials. Potential health benefits include reducing the numbers of vermin in the household and sterilization and preservation of food. More systematic investigation is clearly needed to pin down these relationship (Shanahan 1987).

4. WHAT CAN BE DONE?

Even though it is not yet possible to produce precise estimates of the health effects caused by decentralized biofuel use, enough is known of the effects to warrant efforts to reduce them. An integrated approach to control would include economic, managerial, political and social issues, but for now it may be most valuable to discuss this question briefly with regard to two of the technical "fixes": changes in fuels and stoves to achieve lower smoke emissions, and higher fuel utilization. (Options for improving biofuel production and harvesting techniques were discussed in Part 1).

There have been problems in developing standard techniques for measuring both fuel efficiency and smoke emissions from open stoves, and for determining the fuel use and human smoke exposures that result. Individual differences in tending the fire can make large differences in all these factors. As a result not only do laboratory results often differ substantially from field data but, unless great care is taken, from one test to another. Nevertheless, it is possible to make some tentative generalizations (Baldwin 1987; Ahuja et al. 1987; Smith 1987a).

4.1 Fuel

In general, there seems to be more variation in fuel use and smoke emissions among different combustion conditions than among different types of unprocessed biofuel. Few studies have been done of the many different types of crop residues, but, under common conditions in small stoves, residues seem to be somewhat smokier and less efficient than wood, but less smokey and more efficient than animal dung (see chapter 4 above). It does seem to be possible to make some generalizations about some physical parameters. For example, for any stove and fuel type there seems to be an optimum ratio of surface area to volume (size of fuel pieces), and optimum fuel moisture content for either emissions or efficiency, but not necessarily at the same points. In general, these optima seem to lie in the range of sticks of 2 to 4 cm in diameter and air-dried moisture levels, but tests would have to be done on any one stove/fuel combination to be more specific. Indeed, stove arrangements have been found in which the highest combustion efficiency and lowest emissions occur with wood of 50 per cent moisture (Islam et al. 1986).

It is generally true to say that the combustion of upgraded biofuels such as charcoal will create less pollution in the household than the combustion of unprocessed biofuels (Islam 1987). More wood will have to be harvested, but substantially less weight (although about the same volume) will have to be carried to the house (Bormann et al. 1988). At the risk of some oversimplification, it can be said that from an air pollution emissions standpoint charcoal making separates the two major categories of biofuel air pollutants. Instead of releasing particulate/hydrocarbons and carbon monoxide (CO) together as does wood when burned, the first is mostly released when making the charcoal and the second mostly when burning it. This would seem to be an advantage in that at least a great part of the noxious material is now released outdoors at the charcoal kiln and probably far away from the house.

In the case of charcoal emissions, however, this apparent benefit can some-times actually create extra risk. CO exposure is a hazard not only on a long-term basis but also over the short term if exposures are high enough. Normally, however, it is impossible to succumb to CO poisoning from the smoke of wood or other forms of natural biofuel. This is because the concentrations of hydrocarbons in the smoke increase along with CO, and long before CO exposures have reached dangerous levels people will be awakened and driven from the room because of the intense irritation caused by the aldehydes and other organic chemicals in the smoke. While many of the hydrocarbons are long-term hazards, therefore, their presence can be beneficial in the short term because they act as a warning for build-up of CO concentrations. However, low volatile solid fuels, which do not produce this hydrocarbon alarm can and do cause CO poisoning, as in Korea, Iran, Afghanistan, northern China, and elsewhere where coal and/or charcoal is used as heating fuel.

This a programme to replace biofuels with a low-volatile solid fuel (whether charcoal or coal) must be careful to take safety into account. The stove and ventilation conditions should be examined to be sure that CO poisoning does not occur. In addition, the public must somehow be informed of the danger because CO by itself is essentially not detectable by normal human senses.

4.2 Stoves

Even less work has been done to determine how modifications in cooking stove design affect emissions, although considerable effort has gone into studies of efficiency. Much information can be gleaned, however, from the extensive research done with wood-fired metal heating stoves that have recently become popular again in many developed countries. Indeed, many developed countries have rapidly developed and promulgated rigid air pollution controls for household wood stoves because of the high emission levels characterizing most traditional designs. In the USA, for example, the Environmental Protection Agency, pushed by a lawsuit brought by the Natural Resources Defense Council, has recently announced wood stove emission standards to be enforced on new stoves. This has been justified because, by the mid 1980s, wood stoves had probably become the largest source of several important categories of air pollution in the country - exceeding, for example, the CO emissions of all US industry and matching the entire power industry in particulate emissions (USEPA 1987).

The concern in developed countries, of course, relates to outdoor air quality since metal heating stoves essentially all have flues or chimneys. The village cooking stove, on the other hand, typically does not and emits directly into the household environment. Many of the improved stove programmes around the world have promoted stoves with flues. Sometimes these stoves are called "smokeless", although they are not designed to emit less smoke but to direct the smoke out of the house. Indeed, the most common designs probably actually increase total smoke output compared to the traditional open-combustion stove.

The history of improved village stoves since the middle of the twentieth century has been characterized by three overlapping periods. The earliest of "Classic" period focussed on reducing smoke exposures, but generally did not apply scientific approaches to design, promotion, and testing. The energy period stoves, which came about during the 1970s in response to energy - environment concerns, focused on improving fuel efficiency. All too often, however, these programmes also failed to apply scientific and critical methods.

At present, a new stage is appearing, although programmes representing both older approaches are still active. The new period, which here will be called "Phoenix", attempts to learn from the past and to incorporate the lessons learned in both earlier periods (Smith 1989). Some of the important lessons are:

Both improved fuel utilization and reduced smoke exposures need to be considered as primary goals. Indeed, most post-dissemination surveys of improved stoves introduced to areas where traditional stoves cause large exposures have found the reduced smoke exposure is cited more often than improved efficiency as the largest benefit to users.

Considerable engineering and market research is needed before a new model can be successfully disseminated. Field research must incorporate study designs that are capable of providing statistical statements of user perceptions and stove performance. More work needs to go into development of standard methods for measuring efficiency and exposures under laboratory simulated, and field conditions.

Social niches exist for both locally made stoves of local materials as well as centrally made devices of metal or ceramic in which stricter quality control and economics of scale apply. both welfare and market approaches to dissemination must be developed as they will both be appropriate.

Stove programmes should not expect to be able to optimize one or two aspects of traditional stoves while maintaining all their other characteristics such as portability, flexibility, zero cost, insect fumigation, and room lighting. This is not to argue that such functions are unimportant but that they will need to be addressed by other means. Economic and technological development has nearly always been accompanied by specialization and there is no reason why the evolution of the cooking stove should be any different.

There are trade-offs between efficiency and emissions in many stove designs. Efficiency and low exposures may seem to be and indeed are, in general, compatible goals. After all, the source of most emissions from biofuel combustion is incomplete combustion, thus high combustion efficiency means low emission factors (emissions per unit fuel). Unfortunately, however, some of the principal techniques used by stove designers to increase efficiency actually increase emission factors as well. This comes about because overall stove efficiency is a combination of two separable internal efficiencies: Those of combustion and heat transfer. Enclosing the combustion chamber and reducing airflow - two common approaches in improved stoves - may increase overall efficiency by increasing heat transfer efficiency. This may, however, actually decrease the combustion efficiency because of poorer turbulence and a lower airfuel ratio. Therefore the result can be increases in both overall thermal efficiency and emission factors, so care must be taken to improve or at least maintain combustion efficiency when seeking modifications to improve overall fuel utilization.

The prediction of the health impacts of changes in heat transfer, combustion and overall efficiencies is not straightforward because *exposure* is not a direct function of emission factors and fuel utilization is not a direct function of efficiency. Both are also affected by the emissions rate, food cooked, cooking time, room ventilation, manner of tending stove, and other factors that may themselves by changed by modifications in stoves designed to improve fuel utilization or lower exposures. In some cases, for example, an increased emission factor per unit fuel may be more than compensated for by a decrease in total fuel usage and cooking time. On the other hand, lower emission factors themselves do not guarantee decreases in exposures.

4.3 What about smokeless stoves?

It might be though that the above discussion refers only to stove improvements that do not incorporate flues. Unfortunately, this is not so. It is clear from several studies in India, for example, that the existence of a flue is not sufficient to guarantee a significant reduction in human exposures under field conditions. A number of factors seem to be involved, but in general it is unfortunately true to say that stoves in the field are often not built, operated, or maintained in the ways intended by their designers. In addition, users may frequently substitute fuels and pots in ways that lead to smoke releases. Thus, field tests are needed to verify the extent of exposure reductions. Even user perceptions can be misleading because not all of the critical pollutants are readily sensed, although surveying such perceptions is obviously important for other reasons.

Another factor that tends to limit the exposure reduction benefits of flued stoves is the entry of smoke from outside the house. Since smoke is still produced (even, in some cases, in greater amounts) by flued stoves, the outside air can become heavily polluted. When houses are close together, stoves are used at the same time of day, and outdoor ventilation is low (as in the dry winter season characterizing many continental areas) local ambient air pollution can reach high levels. In these cases, the relatively high vandalization rates of village housing can lead to a significant indoor concentration even when the flued stoves are still working well. In such conditions, homes using biogas for cooking can experience nearly as high concentrations

as nearby homes using traditional fuels even though biogas combustion itself contributes very little (Ramakrishna et al 1989). A study in Nepal, on the other hand, where houses were widely spaced horizontally and vertically, found significantly lower exposures among women cooking on smokeless stoves (Reid et al 1986).

To be truly smokeless, stoves need to incorporate features such as secondary combustion chambers that directly decrease emission. Unfortunately, it has turned out be difficult to design such devices to operate reliably. This is true even for metal heating stoves in developed countries, which cost many hundreds of dollars. In what might be called the "wood stove dilemma", the rate of energy (power) needed by typical houses occurs just at the lower limit of wood burn rates at which high combustion efficiency and low emissions can be easily maintained. Unfortunately, the typical power needs for household cooking creates this same problem.

One approach to accomplishing the sometimes conflicting goals of low exposure and high efficiency is to optimize stove design for efficiency when used on a fireplace - like hearth under a chimney rather than with a flue. such arrangements have been found to be quite effective in field measurements in India, for example (ramakrishna et al. 1988). In addition, the chimney arrangement can often be made of the same kind of materials used for the walls of the house itself.

5. CONCLUSION

Although the smell of dilute biofuel smoke and the sight of open flames apparently evoke nostalgia in many people, the high smoke levels and risk of burns experienced by much of humanity are clearly not conducive to a sustained high quality of life. A range of fuel, stove, and require efforts at village as well as government level to be successful (Cacacres el al. 1988). More effort will be needed to understand how biofuel use, household labour efficiency and health interact so that such strategies can be most effective.

The history of the would has shown that at every occasion where alternatives have been available and affordable, people eagerly turn away from unprocessed solid fuels for cooking. Indeed, it is possible to identify local evolutionary paths for cooking stove technology that over time generally lead away from biofuels used in open combustion towards stove/fuel combinations that produce improved kitchen working conditions through increased efficiency and cleanliness (Smith 1987c). For a substantial number of years to come. large populations will unavoidably remain reliant on simple biofuels that are inconvenient, dirty, bulky, hard to control, inefficient, and otherwise unsuited to cooking. It is to be hoped that the improved stoves of the Phoenix Period will mitigate the impact of these characteristics and thus help make the use of simple biofuels more comfortable and sustainable. Indeed, it may be appropriate to establish a minimum degree of kitchen comfort (efficiency and cleanliness) as a basic human need analogous to needs for food, shelter, and education. This might correspond in some areas, for example, to a high efficiency woodstove with flue, as indicated in figure 12.2. Given the number of workers in the "occupation" of cooking (second only to farm workers) and the direct and indirect benefits to small children of improved kitchens, such an effort would seem well worthwhile.

6. NOTES

1. See, for example, the studies summarized in Smith 1987a, and the many valuable working papers commissioned by the Rural Employment Policy Research programme of the International Labour Office, Geneva.

2. Evidence and discussions of this network of problems can be found in the increasingly sophisticated and compelling literature on women, rural development, and energy. See, for example, excellent discussions in Agarwal 1986: Bajracharya et al. 1985: Cecelski 1985: Cecelski et al 1986: Hoskins 1979, 1983: Sarin 1987: and Tinker 1987.

7. REFERENCES

Agarwal, B. (1986) Cold Hearths and Barren Slopes: The Woodfuel Crisis in the Third World, Zed Book, London.

Ahuja, D., Joshi, V. and Smith, K.R. (1987) "Thermal performance and commission characteristics of invented, metal, biomass burning cookstoves: A proposed standard method for measurement, evaluation and performance". Biomass 12, 247-70.

Anderson, H.R. (1978) "Respiratory abnormalities in Papua New Guinea children: the effects of locality and domestic wood smoke pollution, *International Journal of Epidemiology 7*, 127-35.

Bajracharya, D., Standal, B.R., Setboonsarng, S. et al (1985) Fuel use, nutrition intake and rural activities: emerging patterns in Pangma and Madheli, East Nepal, Report to the International Labour office, East-West Resource Systems Institute and University of Hawaii, Honolulu, HI.

Baldwin, S.F. (1987) *Biomass Stoves: Engineering Design, Development and Dissemination,* Volunteers in Technical Assistance, Arlington, VA.

Bormann, F.H. Bormann, B.T. and Smith, K.R. (1988) From earth to hearth: A microcomputer model for comparing biofuel systems. East-West Environment and Policy Institute, Honolulu.

Caceres, E. Caceres, A. Ramakrishna, J. and Smith, K.R. (eds) (1988) *Stoves for People,* Centro Mesoamericano de Estudies Sobre Technolgia Appropiada (CEMAT), Guatemala City (AP 1160).

Cecelski, E. (1985) "The rural energy crisis, women's work and basic needs: Perspectives and approaches to action". International Labour Office Technical Cooperation Report, International Labour Office, Geneva.

Cecelski, E. Kamminga, E. and Tarrant, J. (eds) (1986) "Energy and rural women's work: Proceedings of a preparatory meeting on energy and rural women s work", volume 1, "Energy and rural women's work: Papers of a preparatory meeting on energy and rural women's work", volume II: International Labour Office, Geneva.

Dary, O., Pineda, O. and Belizan, J.M. (1981) "Carbon monoxide contamination in dwellings in poor rural areas of Guatemala". *Bulletin of Environmental Contamination and Toxicology 26*, 24-30.

Grainge, M. and Ahmed, S. (1988) *Handbook of Plants with Pest-Control Properties,* John Wiley & Sons, New York.

Hoskins, M. (1979) "Women in forestry for local community development: A programming guide", paper prepared for the Office of women in Development, Agency for International Development, Washington, DC.Hoskins, M. (1983) "Rural women, forest outputs and forestry projects", discussion draft paper No. MISC/83/3, Food and Agricultural Organization, Rome.

Islam, N. (1987) "Test of combustion properties and pollutant emissions of lignite briqueltes", East-West Resource Systems Institute for the Energy Division, Oak Ridge National Lab, TN.

Islam, N., Fox, J.S., Antal, M.J. et al. (1986) "Study of a concurrent biomass combuster for combustion efficiency and air pollution", *Tenth Conference on Energy from Biomass and Wastes,* Institute of Gas Technology, Chicago.

Jelich, A. (1987) "Mosquito repellency of biomass smoke: development of a standard test and its use on smokes from Leucacna wood, cow dung, and neem leaves". Masters Thesis, College of Human Resources and Education, West Virginia University, Morgantown. WV.

Leowski, J. (1986) "Mortality from acute respiratory infections in children under 5 years of age: Global estimates", *Statistical Quarterly 39,* 138-44.

Lewtas, J. (1986) "A quantitative cancer risk assessment methodology using short-term genetic bioassays: The comparative potency method", in P. Oftedal and A. Brogger (eds). Risk and Reason, Alan R. Liss, New York.

Menon, P. (1988) "Indoor spatial monitoring of combustion generated pollutants by Indian cookstoves", UHMET 88-01. Meteorology Department, University of Hawaii, Honolulu.

Mumford, J.L., He, X.Z., Chapman, R.S. et al. (1987) "Lung cancer and indoor pollution in Xuan Wei, China", *Science 235,*217-35.

Padmavati, S. and Arora, S. (1976) "Sex differences in chronic corpulmonate in Delhi". *British Journal of Diseases of the Chest 70,* 251-59.

Pandey, M.R. (1984) "Domestic smoke pollution and chronic bronchitis in a rural community of the hill region of Nepal", *Thorax 39,* 337-39.

Pandey, M.R. (1985) "Acute respiratory infections among infants and young children", Annual Report to UNICEF, Mrigendra Medical Trust, Katmandu.

Pandey, M.R., Boleij, J.S.M., Smith, K.R. and Wafula, E.M. (1989) "Indoor air pollution in developing countries and acute respiratory infection in children", *Lancet* (Feb. 25 1989), 427-429.

Raggett, S. (1987) "Sarvodaya gives priority to health and safety in Sri Lanka kitchens", *Boiling Point* 13, 11-13.

Ramakrishna, J., Durgaprasad, M.B. and Smith, K.R. (1989) "Indoor air pollution and village stoves in India". *Environment International* (forthcoming).

Reid, H., Smith, K.R. and Sharchand, B. (1986) "Indoor smoke exposures from traditional and improved cookstoves: Comparisons among rural Nepali women". *Mountain Research and Development 6(4),* 293-304.

Sarin, M. (1987) "An evolutionary survey of the Nada Chula system". *Second International Workshop on Stove Dissemination.* Guatemala, Foundation for Woodstove Dissemination, Utrechi.

Sefu, A. (1987) "Improved stoves: Safety is important too", *Boiling Point 13,* 19-20.

Shanahan, Y.J. (ed) (1987) "Statement of the meeting", *Second International Workshop on Stove Dissemination,* Guatemala, Foundation for Woodstove Dissemination, Utrechi

Sloof, R. (1987) "The control of malaria vectors in the context of the Health for All by the Year 2000 global strategy", *Journal of the American Mosaquito Control Association 3(4),* 551-5.

Smith, K.R. (1987a) *Biofuels, Air Pollution, and Health: A Global Review,* Plenum Press, New York.

Smith, K.R. (1987b) "The biofuel transition", *Pacific and Asian Journal of Energy 1 (1),* 13-32.

Smith, K.R. (1987c) "Indoor air quality and the pollution transition", Council on Environment and Health, *International Conference on*

Policy Initiatives for Developing Capabilities in Wood Energy Data Assessment and Integrated Planning

by

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1. INTRODUCTION

The topic of this paper is Policy Initiatives for developing capabilities in Wood Energy Data Assessment and Integrated Planning.

The focus of the paper is on Policy Initiatives the key words in this topic are Wood Energy, Data, Assessment, Integrated Planning and Capability Development.

The aim of this paper, in general, is to discuss and highlight the policy issues and measures which will help in the sustainable production and use of wood aid other biomass fuels. In particular it will concentrate on the issues if data assessment and integrated planning. Some of these issues have already been discussed by previous papers in this seminar and some will be dealt with in greater detail in subsequent papers. For the scale of completion and coherence, I will touch briefly on some topics and discuss in greater detail and other relevant issues. Energy planning is a sub-set of overall economic or development plan. Wood-fuels/biomass fuels form a part of a whole range of commercial/fossil and non-commercial/renewable energy options available to planners. In the case of developing countries. These wood or biomass fuels are critically important as they form a substantial and in some cases the major part (20-80%) of total energy consumption specially in rural areas and by scaler sections.

The basic goal of energy planning is to establish a set of effective policy objectives, program measures and worktable investment strategies and operational plans for achieving those objectives. Planning must start with a philosophy - a conceptual and analytical framework which will define the priorities, objectives and goals of the plan. In addition to be successful the plan must address the geo-climatic, socio-political, cultural, economic and environmental realities and constraints of the place and the timers in which it is to operate. In addition the plan must have a strategy, methodology and an operational plan to achieve these objectives both at the macro and micro level. Thus the planning excursive will have a global, national and regional perspective but at the same time, it must be securitive to the situation and people needs and perceptions at the local level.

In the part energy policy of the developing national was guided in the context of dual fuel crises of oil and woodfuel resources. Oil crises has received for the time being and these are evidences that woodfuel crisis, as understood in the part, as cause of deforestation and in terms of only a resource depletion problem, is either no longer valid or at least is not as imagined before.

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[1] Development Alternatives - India

Today it is realized that energy problem is a much more complex issue with linkages with a host of other sectors of economy and inter-linkages among energy sub-sectors. Thus intersectoral conflict resolution and minimization of inter-sectoral sub-optimization becomes a paramount concern of optimal energy planning.

Today these is much more concern with debt burdens, restore during of society and equitable distribution of the fruits of development. Special emphasis is needed in meeting the needs of poor and disadvantaged groups. In addition these is growing awareness and concern about the environmental problems and these consequences at the global, regional and sub-regional level.

These is now a realization that the key issue is the energy services needed by the people and not energy consumption per..... Thus energy demand and resource availability in themselves are not sufficient as a predicator of energy planning exercise. The emphasis is now on following development paths and policies which provide adequate energy services is an equitable manner through a mix of appropriate and sustainable energy supplies. The focus is, therefore, on conservation, energy efficiency and charges in pattern of consumption and life-styles - as well as on balances resource development.

Another important point to remember is that energy planning is a dynamic process. Needs change influencing pattern of consumption. Similarly supply of fuel resources may change due to depletion and availability of new and renewable energy sources. Thus energy planning must be an interactive and on-going process.

In recent years the concept of integrated energy planning has gained acceptance. The most important features of this concept are:

(1) Sound database,
(2) Feasible and consistent set of targets which are agreed upon,
(3) Information dissemination,
(4) Coordination and conflict resolution between various groups of actors in energy policy formulation and division .....,
(5) Interactive nature of the process which stresses on feedback hoops.

It is a flexible approach which tends itself to be applied in different situation. Its stress is on process and not on outputs (policies, programmes or projects). It recognizes that assumptions will have to change through time and special locations and policies, plans and programmers will have to be adapted accordingly.

Three levels of integration are important in IEP.

- Energy Economic Plan
- Plans of different energy subsectors
- Various individual components of energy sub-sector plans

These are nine major steps in integrated energy planning exercise.

2. WOOD AND BIOMASS FUELS

- Biomass fuels account for 20-90% of energy consumption. In rural areas share is higher.

- 15-50% are from forest, rest from non-forest areas.

- Rural and urban poor households are the main consumers. Other - rural industries; - small establishments.

- Transitions from biofuels to commercial fuels. This is more in urban areas but still a large number of people especially poor depend on fuelwood in urban areas.

- In both urban areas people ..... purchase fuelwood and other biomass fuel. but even in rural areas a significant number of people purchase wood fuels.

- The share of fuelwood is decreasing but in terms of quantity it is increasing because of increase in population.

- Wood fuel flows are complex. Flow of fuelwood maybe from village to urban areas and also in opposite division.

- Fuelwood sale is a source of income by rural poors. This fact is often overlooked by planners. Until alternative employment is provided wood cutters will continue to cut trees from forest and other areas.

- Many people in rural areas sell their fuelwood and use themselves lower grade fuels like residues.

- Local level trade-offs are important but information is lacking.

- Use of biomass fuels is influenced by complex interaction between energy and forestry sector as well as other sectors such as agriculture, industry and power-sector (electricity).

3. ISSUES

(a) National Economy: The failure to adequately account for wood energy (especially when used as a "non-commercial" fuel) in the national income accounts or GDP has contributed to the failure to recognize its overall value to national economies.

(b) Common Definitions/Methodologies/Language: The wood energy sector needs to establish a mature and universal set of definitions, methodologies and language in order to advance the development and management of the resource base. The present status of wood energy data development and assessment has not led to full confidence in assessments of the availability or utilization of the resource.

(c) Political Awareness/Commitment: There is a critical need to increase the political awareness of and commitment to the specific role of wood energy in most developing

countries. In may developing countries, wood energy is the primary source of energy and is the only source of energy for the rural and urban poor. As such, the role of wood energy is crucial to the social welfare of major segments of the population. Present political awareness and commitments do not appear to recognize this fact.

(d) Sector Linkages: The general weak linkages between land development/use the forestry, agriculture and energy sectors has hampered a coordinated development of wood energy.

(e) Appropriate Technologies and R & D: There is a critical need for more appropriate and efficient wood energy conversion and utilization technologies. End-user needs must be incorporated at the design stage and this can best be done by direct involvement of the end-user in the design process. Additionally, the tendency to test and demonstrate imported technologies in developing countries should be discouraged.

(f) International/National/Local Coordination: There appears to be insufficient coordination of international, national and local sponsored wood energy development programs. In some developing countries this has led to some programs trying to reduce the dependance on wood energy while others are trying to increase the dependance and supply of wood energy.

(g) Human Resource Development/Training: There is a continuing need for the provision of training and fostering of qualified persons to meet the needs of the wood energy sector. This is especially true if wood energy data, assessments and planning are to be incorporated into local and national level energy and economic planning.

(h) Reliable, Accurate and Current Data to Support Policy and Planning: The emphasis on addressing wood energy development through appropriate policy and planning programs at both the national and local levels dictates the need for more reliable, accurate and up-to-date data on wood energy supply and demand. Obtaining wood energy data should not be one time "static" process but a repetitive "dynamic" process and should be made a regular part of the compilation of national energy statistics.

(i) Promote Tree Growing on Private, Marginal and Degraded Forest Lands: Active programs to promote tree growing on private, marginal and degraded forest lands should be supported. To the extent feasible, the promotion of tree growing should be done within a framework of economic incentives for the tree growers.

(j) National and Local Wood Energy Planning: To be effective, wood energy planning must be done at the national as well as local levels. National wood energy planning without local participation will result in misrepresentations and difficulty or resistance in implementation. Wood energy planning at the local level without national coordination could result in a mismatch of local and national objectives and a collapse of the local strategy due to external counter-acting forces.

(k) Importance of Understanding Wood energy Balances and Flows: A prerequisite to effective wood energy planning at any level is the solid understanding of wood energy balances and flows.

(l) Economics of Wood Energy Development: The economics of wood energy development must be considered prior to the promotion of any wood energy development program. Within this context however, careful and serious consideration must be given to the "non-quantifiable" or "externalized" social and environmental benefits and costs associated with wood energy development and the alternate options.

(m) Investment Requirements: Investment requirements of wood energy development must be considered at the outset in order to arrive at achievable, wood energy development programs.

4. HISTORICAL BACKGROUND

* Dominance of electricity subsector
  - supply side consider
  - technology fix
  - no attend to demand management
  - import of electricity pricing not appreciated

* Shift to liquid fuel - oil
  - depend on import
  - energy price and pricing

* Energy high on political age NDA

* Weakness of sub-sectoral planning realized

* Realisation of fuelwood crisis - traditional fuels role

* Resource constraint

* Energy master plan, failed
  - monolithic and inflexible
  - end in itself

5. MASTER PLAN

* Inadequate and questionable reliability of database

* Over-sophisticated analytical tools

* No linkage between plan formulation and implementation

* Inadequate linkage with economics plan

* Lack of continuity in the planning
  - No interation feed back

6. PLANNING PERSPECTIVES

* Development philosophy
  - framework
  - restructuring equitable dist. of goods and services
  - reducing debt burden - self sufficiency
  - global, national and local environment concerns
  - adequate and secure energy services in a sustainable manner:
    - efficiency/conservation
    - changes in life styles or pattern of cons..
  - balances resource development
  - decentralization
    - flexibility
    - responsiveness
  - employment generation
  - integrated energy planning

Figure 1: Two-way processes in IEP

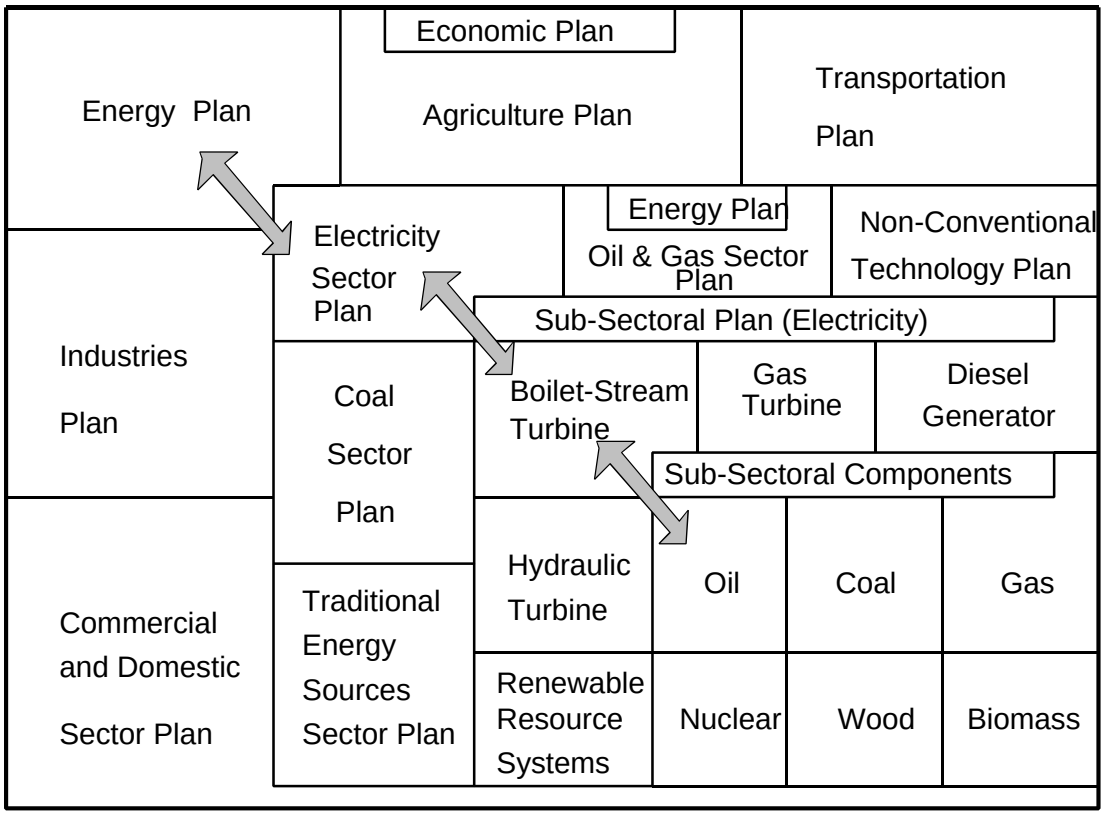


Figure 2: Integrated Energy Planning Access

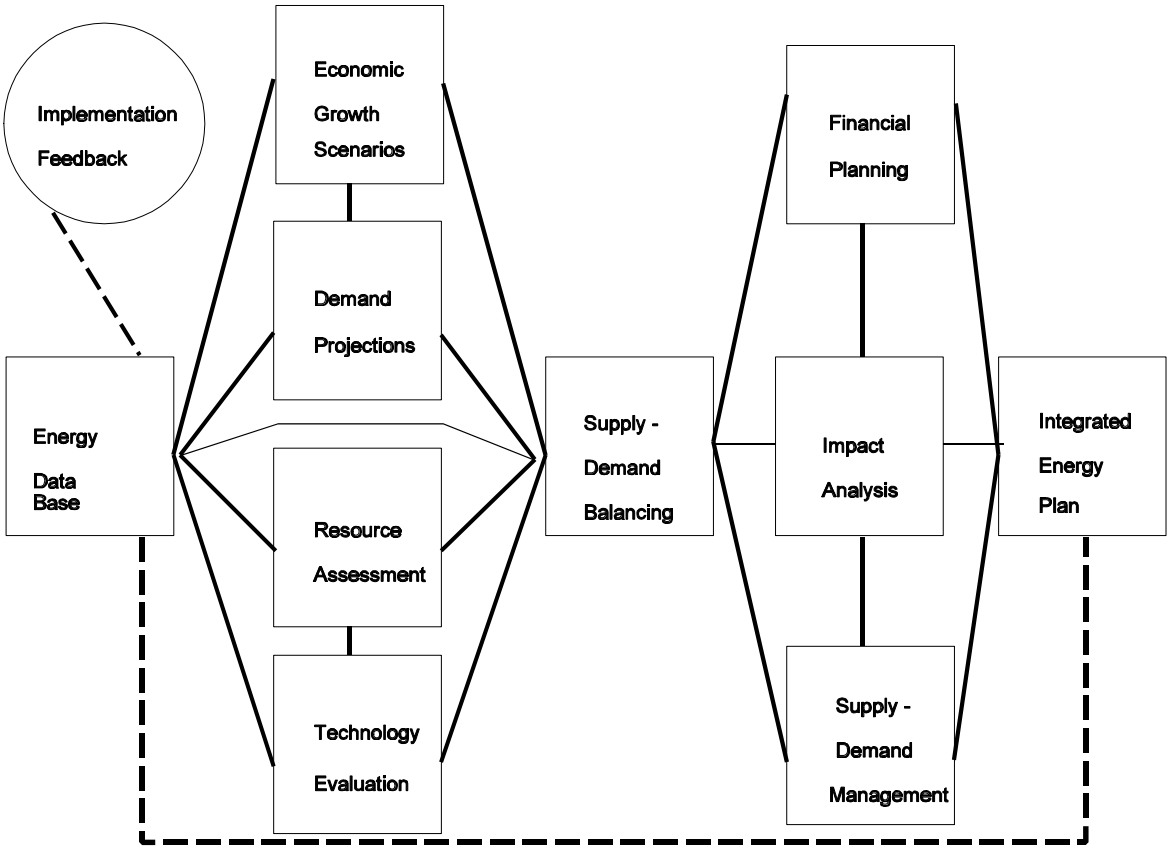


Figure 3: Energy for and From Agriculture

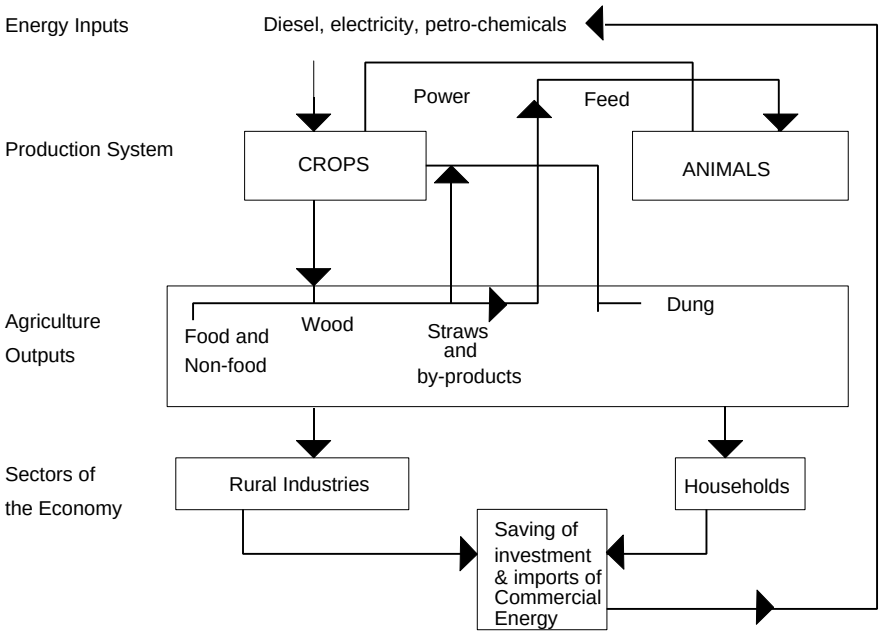


Figure 4: Gusain Cube

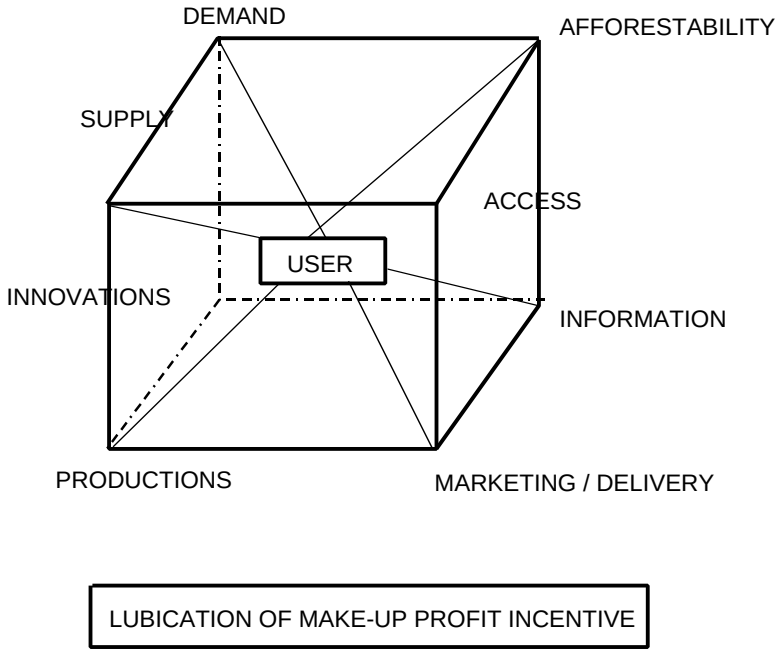


Figure 5: Primary Wood Resource Flows

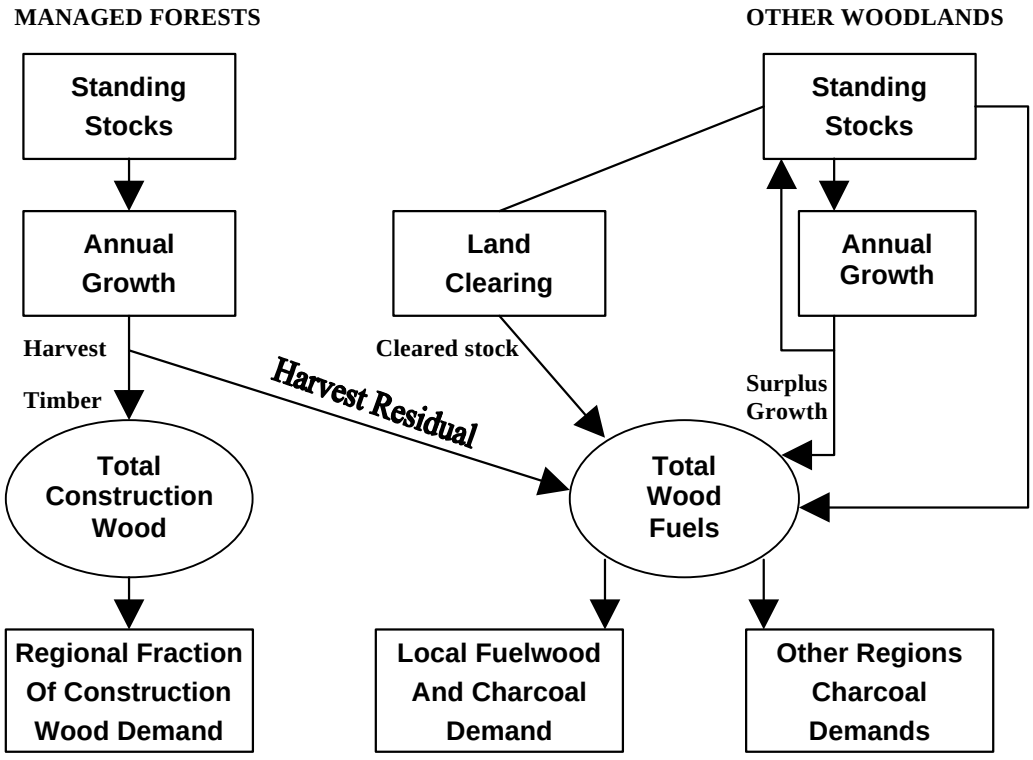


Figure 6: Structure of the Planning Commission and Energy Planning System

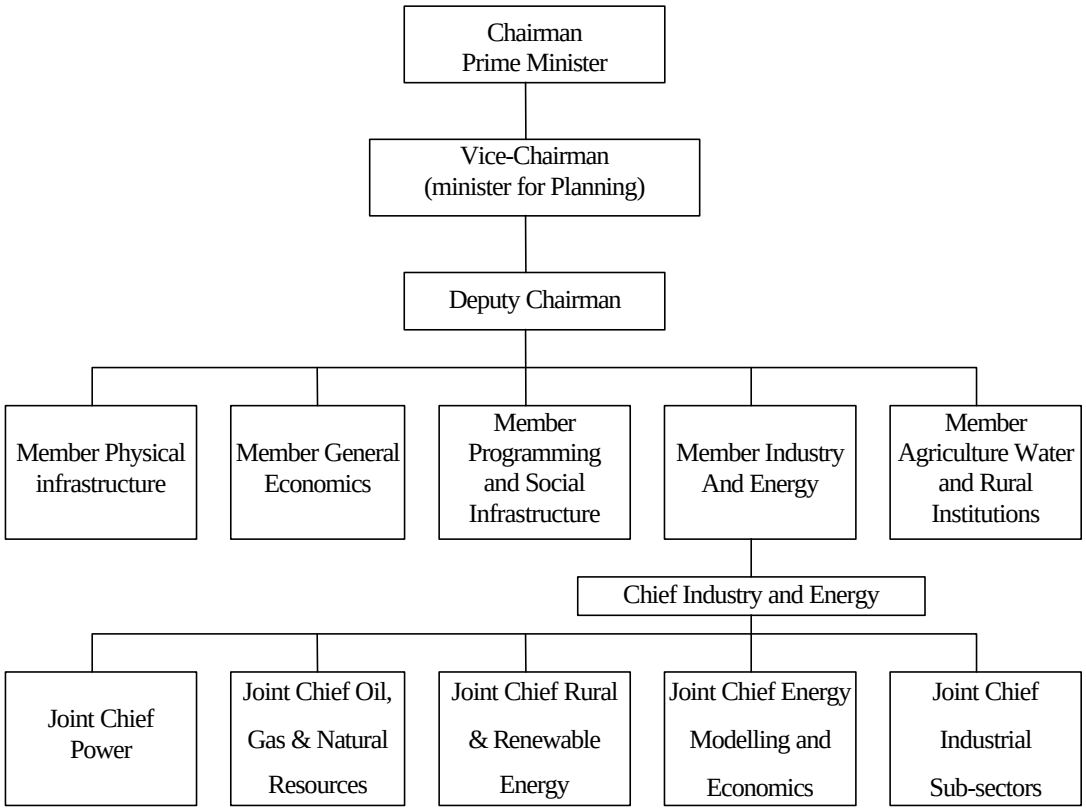
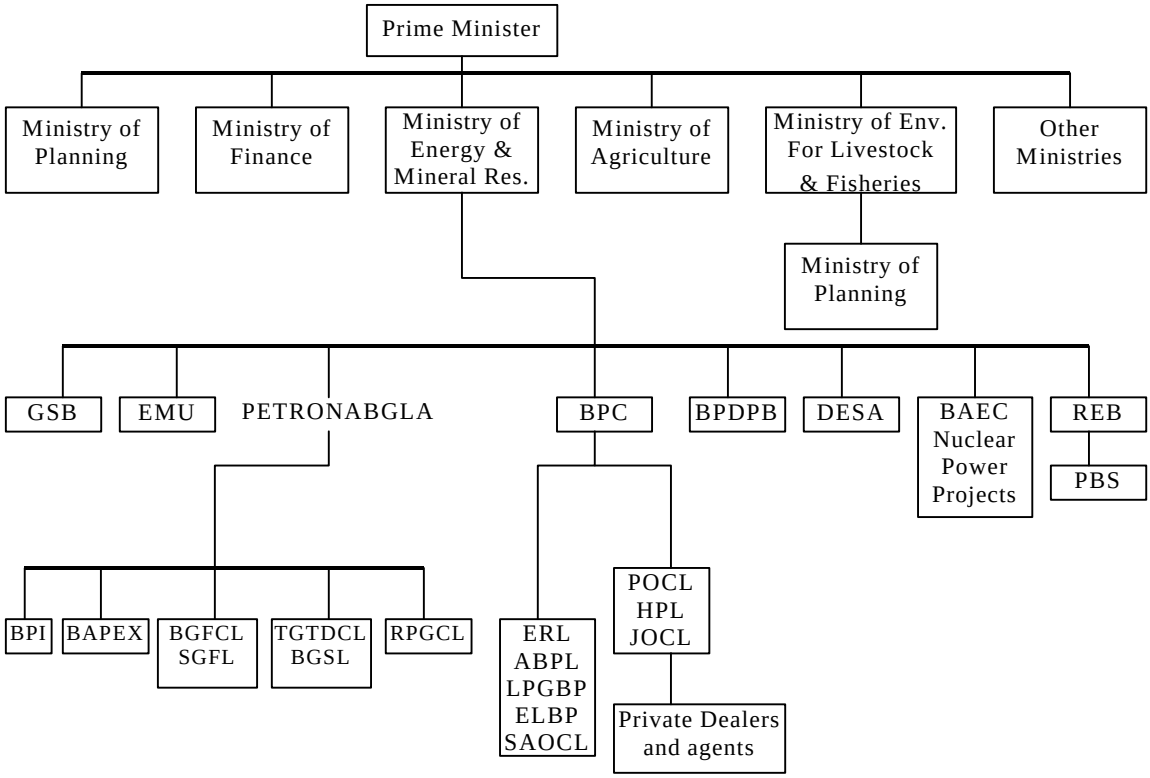


Figure 7: Structure of Energy Ministry and Energy Agencies



ABPL	Asphaltic Bitumen Plant Ltd.
BAEC	Bangladesh Atomic Energy Commission
BAPEX	Bangladesh Petroleum Exploration Co. Ltd.
BGFCL	Bangladesh Gas Fields Co. Ltd.
BGSL	Bakhrabad Gas Systems Ltd.
BPC	Bangladesh Petroleum Corporation
BPDB	Bangladesh Power Development Board
BPI	Bangladesh Petroleum Institute
DESA	Dhaka Electricity Supply Authority
ELBP	Eastern Lube Blending Plant
EMU	Energy Monitoring Unit
ERL	Eastern Refinery Ltd.
GSB	Geological Survey of Bangladesh
JGTDSL	Jalalabad Gas Transmission and Distribution Co. Ltd.
JOCL	Jamuna Oil Compnay Ltd.
LPGBP	LPG Bottling Plant
MPL	Meghna Petroleum Ltd.
PBS	Palli Bidyut Samity (Rural Electricity Society)
PETROBANGLA	Bangladesh Oil Gas and Minerals Corporation
POCL	Padma Oil Co. Ltd.
REB	Rural Electrification Board
RPGCL	Rupantarito Prakritik Gas Co. Ltd.
SAOCL	Standard Asiatic Oil Co. Ltd.
SGFL	Sylhet Gas Fields Ltd.
TGTDCL	Titas Gas Transmission and Distribution Col. Ltd.

Policy Options for Wood Energy Resource Management Strategies in Asia-Pacific[1]

by

Chun K. Lai[2]

1. DEFINING THE PARAMETERS

It would be presumptuous to treat all the complex dimensions of this paper's theme: policy options for wood energy resource management strategies in Asia-Pacific. Hence, it is necessary to define the parameters within which investigation, discussion and analysis can follow.

What and Where are "Wood Energy Resources"?

An FAO global study on fuelwood supplies in developing countries classified woodfuel resources into four categories (de Montalembert and Clement 1983):

* **natural woody vegetation** -- natural formations in which "woody elements cover more than 10% of the ground
* **plantations** -- forest stands established artificially (for industrial, energy or other purposes)
* **woody resources on agricultural lands** -- "row plantations, hedges, village and family woodlots, orchards and trees scattered over agricultural areas"; this would include the present terminology of agroforestry, farm forestry and home gardens
* **industrial residuals** -- residues from wood industries that can be used as fuel

While many government and international organizations have supported and continue to support fuelwood plantations as the key strategy toward meeting wood energy needs, the lion's share of woodfuels come from "natural woody vegetation" and "woody resources on agricultural lands," which may be simply termed "natural forests" and "agroforestry." The aforementioned FAO study showed that in 1980, natural forests in the Asia-Pacific region accounted for about 715 million m^3 of woody material (more than half were in inaccessible areas), agroforestry accounted for about 118 million m^3, while plantations yielded only 29 million m^3 (with 20 million m^3 from S. Korea alone). In the Middle Hills of Nepal, there were over 4 million ha of total forest area in 1988, less than 1 percent of which were under plantations (Gilmour and Fisher 1991). These data may be now outdated, but the trends are still valid, and form the basis for defining the first parameter (see next page).

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[1] Paper presented at Seminar on "Policy Instruments for Implementation of Wood Energy Development Programmes" organized by FAO-RWEDP and held 1-3 March, 1993 in Chiang Mai, Thailand.

[2] Regional Coordinator, Asia-Pacific Agroforestry Network, FAO-APAN, P.O. Box 481, Bogor 16004, Indonesia.

Parameter 1: This paper will focus on community-based policy options for improved natural forest management and agroforestry management strategies in Asia-Pacific.

Forest area per rural inhabitant is extremely low in Asia, particularly in South Asian countries, relative to the average ratio in tropical developing countries (see table 1). Contrasting the average forest area per capita in South Asia (0.10 ha/person) with that in Southeast Asia (0.79 ha/person) leads to the following assumption:

Parameter 2: Agroforestry (on agricultural and private lands) should be the key strategy for woodfuel production in South Asia, while improved natural forest management should be the primary strategy in Southeast Asia.

In South Asian countries such as Bangladesh and Pakistan (with 0.01 and 0.03 ha of forest area per rural population, respectively), agroforestry supplies an extremely high proportion of the national wood needs. Homestead "forests" provide about 85 percent of all wood consumed in Bangladesh (Douglas 1982). In Pakistan, about 90 percent of fuelwood comes from non-forest lands: private farmlands and wastelands (Hussain 1990).

It has already been noted that large areas of natural forests are "inaccessible" -- either because of geographic remoteness or policy restrictions. In Indonesia (relatively forest-rich at 0.94 ha/person), roundwood production in 1987 was some 152 million m^3. Fuelwood consumption accounted for 76 percent of the total production, with nearly half of the fuelwood from home gardens (Government of Indonesia/FAO 1990). Agroforestry, in the form of home gardens and farm forestry, appears to be the most important source of woodfuel for domestic consumption in most areas of the region.

Table 1. Forest area to rural inhabitant ratios in South and Southeast Asia.

Country	Forest Area (000 ha)	Rural Population (000)	Area/capita (ha/person)
South Asia:	**73,527**	**764,206**	**0.10**
Bangladesh	927	89,139	0.01
Bhutan	2,140	1,300	1.65
India	64,200	572,955	0.11
Nepal	2,121	15,612	0.14
Pakistan	2,480	72,490	0.03
Sri Lanka	1,659	12,710	0.13
Southeast Asia:	**231,400**	**294,565**	**0.79**
Indonesia	116,895	124,294	0.94
Kampuchea	12,648	6,498	1.94
Laos	13,625	3,024	4.51
Malaysia	20,986	9,543	2.20
Myanmar	31,941	28,571	1.12
Papua New Guinea	38,175	3,011	12.68
Philippines	9,510	33,276	0.29
Thailand	15,675	41,393	0.14
Vietnam	10,110	47,871	0.21
ASIA	**304,927**	**1,058,771**	**0.29**
All Tropical Developing Countries	**1,771,181**	**1,436,077**	**1.23**

Source: World Resources Institute 1991

2. FOREST POLICY

".....it seems rather odd for us to enforce the reserve forest law on people in the forest which became reserved only subsequently by the mere drawing of lines on pieces of paper. The problem arises inasmuch as with the delineation done, as these people became violators of law. From the view point of law it is a violation because the law was duly enacted. But according to natural law the violator of law is he who drew the lines, because people possess the right to live. Thus it is the authorities who encroached upon the rights of individuals and not the individuals who transgressed the law....."[3]

[3] His Majesty the King of Thailand in an address before a gathering of lawyers (quoted in Rao 1992)

In broad terms, a "policy" is the way in which a government uses its institutional and legal means to carry out programmes aimed at achieving chosen objectives (Husch 1987). In this sense, a "forest policy" should not be restricted to the setting of goals or objectives only for national forestry development, but should specify "certain principles regarding the society's forest resources which is felt will contribute to the achievement of some of the objectives of that society" (Worrell 1970). Forest law is the instrument of forest policy.

Does this benevolent definition of forest policy reflect reality? The answer is yes.....and no. Some insights emerged from the Regional Expert Consultation on Forestry Policy Developments and Research Implications held October 1992 at the FAO Regional Office in Bangkok. Reviewing the country papers presented, Dr. Neil Byron concluded that most countries do have a national forest policy statement, but there are major differences in what the policy means, what force or authority it bears, what guidelines are provided on its implementation, and how the policy was derived. In Thailand and Indonesia, it is a policy prepared and issued on behalf of the national government. In Malaysia and India, the policy was primarily prepared by the Forest Department, then sanctioned and issued by the government. In Bangladesh, Fiji and China, it is the policy only within the Forest Department or Ministry (FAO 1992).

Byron also found that as "statements of intent," the national policies could not be challenged; they set national ideals and "unassailable" goals for the forestry sector. The Malaysian country paper stated that no government would ever knowingly choose policy objectives that were not socially ideal. The real problem was underscored in the Pakistan paper:

> Policy is what is implemented on the ground. It is not what is preserved and decorated on the shelf. The taste of the pudding lies in eating it, and the test of policy lies in its implementation. There is no use in formulating a policy if it cannot be implemented (FAO 1992).

Historical Perspective

Wood energy resource management strategies in Asia-Pacific are heavily influenced, in fact, often dictated by the prevailing forest policies. Forest policy and regulations can even protrude into the domain of private lands in several ways, for example: by restricting the harvest of certain "royal" tree species; by declaring certain species as exclusive property of the state (e.g., sandalwood in India); or by requiring mandatory permits for the transport of all wood. Forest policies are increasingly described as "antiquated" or as "colonial legacy," and were conceived in an era when objectives and conditions were radically different from the present. However, even within the existing, outdated policy framework, there is scope for interpreting and implementing elements that can be beneficial to local communities and individuals vis-a-vis "community forestry" and "social forestry." Again, the key is the willingness (or unwillingness) of governments and their forest departments to implement actions in the field, within the limits set by prevailing policy and law.

In historical terms, the concept of state ownership of forest lands is quite recent and had its genesis in the European colonial expansion era between the 16th and 19th centuries. For example, the Spanish introduced this concept in the Philippines shortly after Magellan's arrival on Luzon in 1521 in the form of the Regalian Doctrine, which continues to be the basis for the land law in the Philippines. Some 200 years later, the Dutch made similar claims on the forests of Indonesia (Poffenberger 1990). In South Asia, state control of forests developed during the

height of the British Raj in the 18th and 19th centuries. A common motive for exercising state forest control was profit: hence, the Dutch targeting the teak forests of Java, and the British those of Thailand and Burma. In the process, teak establishment by the *taungya* method (often cited as one of the first "agroforestry interventions") was developed.

Despite these myriad and sometimes long-standing claims, the colonial powers were unable to effectively control forest lands until the late 19th century (Poffenberger 1990). Most present-day forest departments -- and their attendant forest acts, codes, laws and policies -- came into existence during the decades 1860 to 1920.

Customary Laws and Practices

By contrast, customary laws governing the rights, use and regulation of forests by local communities have been in existence for centuries (or even millennia), and are still effective mechanisms for protecting and managing many forest areas in the region. For example, an initial study in upper northern Thailand reported about 150 cases of locally initiated, community-protected forests (Ganjanapan and Ganjanapan 1990). Community forestry in northern Thailand has a long history "embedded in the culture of the region," which used to be an independent political entity. The concept was introduced early in the reign of King Mangrai, who became the first king of Chiang Mai in the late 13th century. The law known as *Mangraiyasatra* stated that the violation of "sacred forests" was an offense. Sacred forests are commonly found in upper watersheds of communities that believe in *phi khun nam*, spirits regarded as the protector of watershed forests. "This belief system provides an underlying morality for the management of resources essential for the type of farming systems existing" in the North (Ganjanapan 1991). When considered in the historical sense, and in the sense evoked by the quotation by His Majesty the King of Thailand (page 5), one may ask: who really are the "encroachers" of the forests in Asia-Pacific?

There are also "indigenous" systems of forest management that are quite recent in origin, and emerge as dynamic responses to changing conditions and needs (Gilmour and Fisher 1991). In Nepal, one study found that the average age of forest committees was then about 7 years (Campbell *et al.* 1987); in another study area, the median age of local systems of forest protection was less than 20 years (Campbell and Bhattarai 1982). These relatively new, indigenous systems (as opposed to "old, traditional" ones) are community responses to increasing scarcity of forest resources (e.g., when accessible forests become more than 3-4 hours walking distance), but they may incorporate long-standing, traditional concepts such as sacred forests.

3. EMERGING POLICY OPTIONS

Against this historical background of less-than-enlightened genesis and evolution of forest policy in the region, has inertia and despair totally set in? Not completely. There are positive signs of policy review, dialogue, reform and change occurring in some countries. Even in an environment where changes in policy (or law, as the instrument of policy) may not be feasible because of bureaucratic resistance, there remains the option of reviewing existing forest policy and law to identify specific parts that can support innovative, community-based forest and agroforestry management strategies.

Often cited in the "antiquated, colonial legacy" category is the 1927 Forest Act, which is the basis of forest law and nationalization of forests in India and Bangladesh. Even in this largely repressive act, the possibility of co-management of public and private forests is explicitly recognized in Section 28, which states:

(1) The Government may assign to any village community the right of Government to or over any land which has been constituted reserved forests, and may cancel such assignment. All forest shall be called village-forest.

(2) The Government may make rules for regulating the management of village-forests, prescribing the conditions under which the community to which any assignment is made may be provided with timber or other forest produce or pasture, and their duties for the protection and improvement of such forests.

(3) All the provisions of this act relating to reserved forest shall (so far as they are not inconsistent with the rules so made) apply to village-forests.

Farooque (1991a) concluded that the 1927 Forest Act does "grant sufficient latitude to the Forest Department (FD) to accommodate social forestry programmes on reserved forest land. The government or the FD on its behalf can frame detailed operational rules granting secures tenure, and participatory management with protection and improvement responsibilities. .....And for the government, there is no insecurity of such investments or divestments because power of recovery is authorized by the act." However, the inherent and major weakness is the failure to recognize and accommodate the customary practices of the resources users. Consequently, these laws regulate titles but not the actual modes of land use. As a result, most laws are "unenforced or institutionally unenforceable, and the ambitious underlying objectives are never achieved" (Farooque 1991b).

Policy Issues and Research Priorities

There has been increasing attention on examining forestry and agroforestry policy issues and implications for research. This present consultation in Chiang Mai is part of that process. Other recent events have included:

* International workshop on Forestry and Agroforestry Policy Research, 9-12 July 1991, hosted by IFPRI, Washington, D.C.

* Regional expert consultation on Forestry Policy Developments and Research Implications, 5-9 October 1992, hosted by FAO Regional Office, Bangkok.

The above gatherings recognized some complementary and recurring policy issues and research priorities (see table 2).

Table 2. Forestry and agroforestry policy issues and research priorities.

IFPRI Workshop:	FAO Consultation:
! macroeconomic/other macro-level studies	! maintaining environmental stability and biodiversity
! land and tree tenure issues	! increasing forest cover on public and private lands
! ways of optimizing land use and rural welfare	! meeting local and national needs for fuel, poles, timber, non-wood forest products, fodder, etc. on a sustainable basis
! effects of organizational reform	! promoting sustainable resource utilization and domestic processing industries
! institutional support, services and infrastructure	! checking soil erosion in watershed and catchment areas
! markets, subsidies and incentives	

Sources: IFPRI 1992; FAO 1992

These articulated issues and priorities signal many growing dichotomies vis-a-vis the effectiveness of forest policy with regard to:

* private vs. public lands
* natural forest management vs. tree plantation
* joint/community management vs. state management
* resource management vs. resource protection
* policy implementation vs. policy revision

However, these may oftentimes be false dichotomies. In reality, it is seldom an "either... or" situation, but effective policy must instead reconcile polar options, and strive to strike a balance. For example: how to achieve both forest resource protection and sustainable community management and use? There is no simple answer.

Paradigm Shift

It is clear that a radical "paradigm shift" is needed away from conventional, state-controlled forestry and toward community-based approaches (Gilmour and Fisher 1991). The inherent differences between the two approaches appear too large to bridge.

Table 3. Characteristics of state forestry versus community forestry/agroforestry.

Characteristics:	State Forestry (conventional, industrial forestry):	Community Forestry and Agroforestry Approaches:
Objectives	One dimensional, raw material for industry, protection.	Multipurpose and socio-economic objectives. Related to the consumer cum producer. Self-reliance.
Technology	Imported, centralized, precedence over local technologies. Uniform and strictly adhered to.	Varies. Indigenous, locally manageable. Imported technology must suit resources and needs.
Local institutions	Unimportant as long as no encroachment.	Important. Used and supported as a resource.
People's Participation	Insignificant. People are target groups and consumers and to be motivated, uplifted and/or employed.	A requirement for relevant production. People are a resource, an asset to be supported. Involvement and responsibility.
Role of people versus experts	People are the problem experts the solution.	People are the solution and a resource. Experts support them and their activities and the development process.
Local solutions	Uniform.	Diverse.
Land	Government.	Communal. Village, private.
Labour	Employed.	Employed within the local system Or self-employed.
Organization	Centralized "work order" system.	Local, village production unit (eg., extended family).
Professional sphere	Segmentation, "Forestry".	Integration with other farming activities.
Structure and magnitude	Few large plantations with uniform management.	A large number of small areas with a variety of input requirements and production.
Legislation	Protective.	Productive.
Time perspective	Long term.	Short term, or limited resources for delayed benefits.
Relation to other activities	Separate.	Integrated in space and time in the small farmers' production system.

Source: Ohlsson and Byron 1989

4. NEW MECHANISMS

In November 1991, a seminar on "Legal Issues in Social Forestry" sponsored by the East-West Center and Ford Foundation was held in Bali, Indonesia. Asian participants were from India, Bangladesh, Thailand, Philippines and Indonesia, and many had prepared papers earlier in 1991 at a social forestry writing workshop at the East-West Center in Hawaii. The focus was on examining three categories of existing mechanisms and arrangements for managing state forest lands through community participation: **forest protection committees, community agreements**, and **individual stewardship agreements** (Fox *et al.* 1991).

Forest protection committees (FPCs) are central to **joint forest management** (JFM) strategies, which have evolved in some Indian states. West Bengal State is a well-known example, where more than 2,000 FPCs are protecting and managing some 300,000 ha of sal (*Shorea robusta*) areas, or 26 percent of the total forest area in the state. FPCs generally do not make any ownership claims on government forest lands, but do enter into contractual or lease arrangements with the state forest departments that provide incentives to the villagers (e.g., rights to intermediate forest products and 25 percent of the final tree harvest). Under this arrangement, the state usually maintains greater control over the land than in community or individual arrangements (Fox *et al.* 1991).

Community arrangements are usually made with long-term forest occupants, such as indigenous or ethnic minority groups, who have some claim to the land through customary law or length of occupancy, but who do not possess state-recognized land title (Fox *et al.* 1991). These can be for fixed, renewable long-term periods, such as 25 years for most of the communal agreements in the Philippines (see table 4). Or, in the case of Nepal, the policy direction is clearly to "hand over" management of the forests back to the communities (with some qualifications and controls). The Forest Policy (HMG 1990) issued as a result of the master planning exercise articulated the government's principles:

> Phased handing over of all the accessible hill forests to the communities, to the extent that they are able and willing to manage them.
>
> ...to entrust the users with the task of protecting and management the forests. The users to receive all of the income...
>
> Retaining the entire staff of the Ministry of Forests and Soil Conservation for their new role as advisers and extensionists.

In Thailand, a Community Forest Act has been drafted by the Royal Forest Department. The proposed act would authorize some forest communities to protect, manage and use forest resources in designated areas. Participating communities would form forest protection committees, be able to cut trees and collect forest products without permission from government officials, and would be exempt from paying royalties and fees (Attanatho 1991).

Table 4. Various existing programmes and legal mechanisms for vesting rights to individuals and communities in some countries in Asia-Pacific.

Country	Programme/ Govt. Implementor	Scope	Mechanism	Duration/ User Rights
Bangla-desh	Thana Reforestation & Nursery Project (agroforestry component); Forest Department (FD)	nation-wide in remnant and degraded sal forests	**individual** contract between FD and participating farmer in agroforestry; usually 0.4-1.2 ha plot/family	1 year, renewable contract; farmer entitled to all agricultural crops, intermediate tree products and 50% of final tree harvest; FD makes major decisions
Indonesia	Java Social Forestry Programme; State Forest Corporation (SFC)	Java-wide on social forestry sites: usually on "critical" production forests	**individual** contract between SFC and farmer participating in social forestry; usually 0.25 ha/farmer	2-year, renewable contract; farmer gets all agriculture crops, fruit trees, fuelwood trees; timber species belong to SFC
India	Joint Forest Management (JFM) Programme: State Governments and Forest Departments (FDs)	10 states have issued JFM guidelines (as of 8/92) in response to Govt. of India June 1990 circular	**JFM** contractual or lease agreement between State FD and user groups (e.g., 2,000 Forest Protection Committees in West Bengal State)	duration of agreement variable, sometimes indefinite (June 1990 circular prescribed 10-year, renewable Working Scheme); beneficiaries given usufruct rights to grasses, branches, "minor" forest produce, and share of timber (usually 25%)
Thailand	National Forest Land Allocation/ Reserved Forest Improvement Projects; HMG of Thailand and Royal Forest Department	primarily in occupied forest areas of north and northeast	**!individual** STK land certificate to forest land occupant based on 1982 occupancy survey **!** in notheast, allocation of non-productive reserved forest land to **landless families**	**!** "temporary" land-use permit; gives farmer usufruct rights; >7 million rai allocated since 1982 **!** provides usufruct rights; target is >14 million rai in 5 years

Country	Programme/ Govt. Implementor	Scope	Mechanisms	Duration/ User Rights
Philip-pines	Integrated Social Forestry Programme; Department of Environment and Natural Resources (DENR)	nation-wide in upland areas	! **individual** Certificate of Stewardship Contract (CSC) between upland farmer and DENR (3-7 ha/family); ! **individual or communal** Forest Lease Management Agreement (FLMA) given to family, community or incorporated group ! Community Stewardship Agreement (CSA); 13 CSAs (avg. size 3,400 ha) issued as of 12/90 to **registered groups** ! Certificate of Ancestral Land Claim (CALC) given to **communities or individual members**	! 25-year, renewable CSC (also for FLMA and CSA); can be inherited by offspring; provides usufruct rights to farmer ! gives rights to harvest, process, sell or use products grown on forest land ! only for "cultural communities" registered with Securities & Exchange Commission, Manila; provides leasing of land on communal basis ! task forces survey and delineate ancestral domains to recognize rights of specific indigenous cultural communities
Vietnam	National Land Allocation Programme; State Forest Enterprises/District Agroforestry Services	nation-wide, mostly in uplands; over 5 million ha allocated to families	long-term production contract between government and **private household or cooperative**	15-60 year renewable contract based on type of land and crop rotation; benefit-sharing defined for tree species
Nepal	Community Forestry Programme; Forest Department (FD)	first developed in hill forests; later in Terai plains	operational plan developed by **user group** and sanctioned by FD	gives secure usufruct rights and legal control to user group; users protect and manage forests, receive all income

Individual arrangements usually take the form of contracts (most are renewable) with farmers or landless families. The contract duration can range from one (Bangladesh) to 60 (Vietnam) years, depending on the country and programme involved (see table 4), and usually

cedes usufruct rights to the farmer for all agricultural produce, at least some of the intermediate tree products (e.g., branches, fodder, fruit), and may or may not include provisions for sharing the tree harvests.

New Problems

Most of these tenurial arrangements have been developed during the past decade. Collectively, they signal a bold, progressive break from conventional, repressive and restrictive forest policies. At the same time, these new programmes and mechanisms have been, and continue to be, fraught with implementation problems. The rhetoric put forth by enlightened policy-makers in the capitals throughout the region do not mesh with the generally meager and disappointing results thus far in the remote forest areas.

Fox *et al.* (1991) underscored the following recurrent implementation problems for:

Forest protection committees, difficulties in:
* securing legal recognition of committees
* resolving conflicts within/between committees, and between committees and the state
* protecting valuable forests (as opposed to degraded forests)
* managing and marketing non-wood forest products
* distributing benefits in an equitable manner

Community agreements, problems with:
* gaining recognition of the rights of forest inhabitants
* defining specific rights such as absolute title and benefit-sharing
* protecting valuable forest areas from outside interest groups
* demarcating boundaries based on history and land use
* distributing rights equitably

Individual stewardship agreements, implementation problems such as:
* defining the rights and responsibilities of forest users and managers
* drawing migrants to stewardship areas, and trying to deal with non-homogenous communities
* equity issues within/between communities and well as intra-household

5. WHERE DO WE GO FROM HERE?

The foregoing sections have attempted to provide a window into the range of complexities and problems associated with emerging policy options and mechanisms for community-based forest and wood energy resource management strategies in the region.

While the surface has been barely scratched, and more in-depth examination beyond the scope of this paper is warranted, six tentative conclusions may be offered for further thought and discussion:

1. ***Existing policy and law is not an acceptable scapegoat for inaction.*** Upon close examination, there are existing policy and legal provisions that can be the basis for action, to support community and individual initiatives in natural forest management and/or agroforestry. These provisions definitely exist in customary

laws and practices; they may also exist in the prevailing forest policy and law, or they may exist in national agrarian codes, or they may exist embodied in national constitutions. The point is: they exist. And the often-heard excuses like "we can't do anything because of legal restrictions" should be rejected. A lot can be done, even within the 1927 Indian Forestry Act (as discussed earlier). As the first course of action: there is the need to re-examine and re-interpret the "antiquated, colonial legacy" policies and laws to see exactly what can be done within the existing framework.

2. ***"Policy reform or revision" is not a panacea in and of itself.*** Although often prescribed, revision of forest policy or legislation can sometimes serve to further centralize government authority. Promoting community forestry legislation may always appear progressive. But often the proposed by-laws require government sanctioning of plans or registration of groups or other qualifying prerequisites that communities must obey. Close reading of some recent "forestry act revisions" within the region reveals that only fines and penalties are "revised" to keep up with inflation.

3. ***Policies must explicitly recognize the primary importance of natural forest areas and agroforestry in supplying woodfuels and other wood and non-wood products.*** This is an unequivocal fact. We must collectively resist attempts by politicians and donors to "push" expensive, ill-conceived tree plantation programmes (often financed through loans that will become the burden of future generations) that lack any sound social, economic, biological or silvicultural basis. Improved natural forest management and agroforestry programmes can be developed at a fraction of the cost, can engender greater local participation, and can sustainably produce a larger volume and wider diversity of goods and services for the local and national economies.

4. ***The single most important policy change would be to explicitly recognize the legitimacy of customary laws, rights and practices as the basis for community protection and management of forest and wood energy resources.*** Eloquent and convincing pleas for this singular change are being made throughout the region, and include the following:

   The Constitution's recognition that the management of land, forest, and other natural resources is to be for the benefit of the Indonesian people is a value rooted in the nation's indigenous cultures. It provides no basis for ignoring or abolishing adat [customary] property rights. Rather, it is, among other things, **a constitutional mandate to recognize the adat property rights** of indigenous forest dwellers so that they will be able to use their unique local knowledge and experience to promote better land and forest management, and thereby benefit all of the Indonesian people. .....the recognition of *hak milik* (private property), *hak-hak masyarakat* (community rights) and *hukum adat* (customary law) rights are acknowledged in the Basic Forestry Law. To date, however, this recognition exists largely on a theoretical level. There are no implementing laws, and therefore the recognition lacks substance and effectiveness (Moniaga 1991).

5. ***The criteria for evaluating any policy or law should be its real impact on the ground.*** Nepal's community forestry policy is one of the most enlightened policies in the retire region. However, it was found that, in 1987, for the 29 hill districts targeted for implementation, less than 4 percent of the total available

land had been handed over to local communities (Karmacharya 1987); and there has been only "very little" land handed over since 1987 (Gilmour and Fisher 1991). Firm policy implementation guidelines and procedures need to be established that can be easily understood and followed by local communities and responsible government officials.

6. ***Increasing grassroots-level awareness of villagers and field staff would be a sound strategy of improving the implementation of policy.*** This requires concerted efforts to produce and disseminate information, in appropriate languages and media, on relevant policies, and the rights and responsibilities of participating communities and agencies. This information must be properly and systematically communicated through action training and education programmes in policy implementation at the grassroots-level. Otherwise, the policy will continue to exist only "on the shelf."

The road ahead is not easy. But do we have any other choice?

6. REFERENCES CITED

Abedin, M.Z., C.K. Lai and M.O. Ali (eds). 1990. *Homestead Plantation and Agroforestry in Bangladesh*. BARI/RWEDP/Winrock International. BRAC Printers, Dhaka.

Attanatho, Weera. Drafting a new community forest act in Thailand. In *Voices from the Field: Fourth Annual Social Forestry Writing Workshop*. J. Fox *et al.* (eds.) East-West Center, Honolulu, Hawaii.

Campbell, J.G. and T.N. Bhattarai. 1982. People and forests in hill Nepal: preliminary presentation of findings of community forestry household and ward leader survey. HMG/UNDP/FAO Community Forestry Development Project Paper No. 10, Kathmandu.

Campbell, J.G., R.J. Shrestha and F. Euphrat. 1987. Socio-economic factors in traditional forest use and management. Preliminary results from a study of community forest management in Nepal. *Banko Janakari* 1(4): 45-54.

de Montalembert, M.R. and J. Clement. 1983. Fuelwood supplies in the developing countries. FAO Forestry Paper 42. FAO, Rome.

Douglas, J.J. 1982. Consumption and supply of wood and bamboo in Bangladesh. Field Document No. 2, UNDP/FAO Project BGD/78/010, Bangladesh Planning Commission, Dhaka [cited in Abedin, Lai and Ali 1988].

Farooque, M. 1991a. "Collective management or untenable tenure: a strategy for saving the Madhupur sal forest in Bangladesh." In *Voices from the Field: Fourth Annual Social Forestry Writing Workshop*. J. Fox *et al.* (eds.) East-West Center, Honolulu, Hawaii.

Farooque, M. 1991b. State of environmental laws in perspective: the case of Bangladesh. Paper prepared for the Ministry of Environment and Forests, Dhaka.

FAO. 1992. Group reports and a review of country papers. Regional Expert Consultation on Forestry Policy Developments and Research Implications, held 5-9 October 1992, FAO-RAPA, Bangkok.

Fox, J., O. Lynch, M. Zimsky and E. Moore (eds.) 1991. *Voices from the Field: Fourth Annual Social Forestry Writing Workshop*. East-West Center, Honolulu, Hawaii.

Ganjanapan, Anan and Sanita Ganjanapan (eds.) 1990. Research report on the cases of community forestry in the North. Social Research Institute, Chiang Mai University.

Ganjanapan, Anan. 1991. Community forestry in northern Thailand: learning from local practices. Faculty of Social Sciences, Chiang Mai University.

Gilmour, D.A. and R.J. Fisher. 1991. *Villagers, Forests and Foresters: The Philosophy, Process and Practice of Community Forestry in Nepal*. Sahayogi Press, Kathmandu.

Government of Indonesia/FAO. 1990. Situation and outlook of the forestry sector in Indonesia. Forestry Studies Technical Report No. 1. Ministry of Forestry/FAO, Jakarta.

HMG. 1990. Forestry Sector Policy: Revised Draft. Master Plan for the Forestry Sector Nepal. His Majesty's Government of Nepal. Ministry of Forest and Soil Conservation, Kathmandu [cited in Gilmour and Fisher 1991].

Husch, B. 1987. Guidelines for forest policy formulation. FAO Forestry Paper 81. FAO, Rome.

Hussain, R.W. 1990. Trees and fuelwood from non-forest lands. Field Document No. 22. FAO-RWEDP, Bangkok.

IFPRI. 1992. *Priorities for Forestry and Agroforestry Policy Research: Report of an International Workshop*. H. Gregersen, P. Oram and J. Spears (eds.) IFPRI, Washington, D.C.

Karmacharya, S.C. 1987. Community forestry management: experiences of the Community Forestry Development Project. *Banko Janakari* 1(4): 30-36 [cited in Gilmour and Fisher 1991].

Moniaga, S. 1991. Towards community-based forestry and recognition of adat property rights in the Outer Islands of Indonesia: a legal and policy analysis. In *Voices from the Field: Fourth Annual Social Forestry Writing Workshop*. J. Fox *et al.* (eds.) East-West Center, Honolulu, Hawaii.

Ohlsson, B.O. and R.N. Byron. 1989. Learning from the small farmers about their trees. Forests, Trees and People Programme. FAO, Rome.

Poffenberger, M. 1990. *Keepers of the Forest: Land Management Alternatives in Southeast Asia*. Ateneo de Manila University Press, Manila.

Rao, Y.S. 1992. Conservation and development of forest resources in the Asia-Pacific region: selected issues. FAO-FORSPA, Bangkok.

World Resources Institute. 1991. *World Resources Report: 1991*. WRI, Washington, D.C.

Worrell. 1970. *Principles of Forest Policy*. McGraw-Hill Book Co. New York [cited in Husch 1987].

What Makes People Cook with Improved Stoves? A Comparative Review

by

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1. INTRODUCTION

About half of the world's population cook with biomass for all or some of their meals. The general pattern of fuel use for cooking in developing countries is that with increasing income people generally move up the LPG, natural gas, or electricity (Alam and coauthors, 1975; Barnes and Qian, 1991; Leach, 1986, 1988; Jones, 1988; Reddy and Reddy, 1983; Natarajan, 1985). This switch occurs most often in urban areas, since scarce cash income in rural areas combined with freely available biomass resources means that people tend to rely more on biomass for cooking. Indeed, if firewood is scarce, people typically move down the energy ladder to use crop residues and dung for cooking, as is commonly seen in Asia. Although relatively uncommon, there are even documented cases in which people have turned to grass and roots for cooking energy. Over the last decade, in many parts of Africa the increase in national income has barely, or not even kept pace with population increasees, so some households have had to switch back from modern fuels to biomass fuels because of low incomes. It is evident that many families have been prevented from making the switch to modern fuels because of low incomes and poor market distribution systemss for modern fuels, especially in smaller cities and towns.

With the discovery of fire, all of humnaity had its start in the center of the energy ladder at firewood. Today, only half of humanity has been able to move up to the higher quality fuels beyond wood and hundreds of millions now must rely on even less desirable biomass fuels (Scurlock and Hall, 1989). Even though there will be some movement up the ladder over the next few decades, billions of people will continued to rely on biomass fuels as their main source of energy, mostly for the basic needs of cooking and space heating. These are the potential beneficiaries of improved stove programs, but, as discussed below, because of a number of constriants, not all biomass using households are currently good candidates for adopting them.

Most traditional biomass stoves are not very efficient. In fact, in controlled tests they can use up to six or seven times more energy than non-biomass stoves (Openshaw, 1979). Because the lack of sufficient cash income prevents poor people from switching to modern fuels, more efficient biomass stoves have been developed that save energy. Potentially such fuel savings can help alleviate local pressure on wood resources, shorten the walking time required to coolect fuel, reduce cash outlays necessary for purchased fuelwood or charcoal, and fiminish the air pollution released into the environment. The many potential benefits of modern, efficient biomass stoves have been obvious since the first discussions of the "fuelwood crisis", and many programs have been undertaken on make improved biomass toves available to potential users.

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[1] A Joint ESMAP/UNDP Report Industry and Energy Department, World Bank, Washington D.C., USA

The crucial questions that must be answered area:

* why, in the face of all of these benefits, have so many people decided not to purchase or use such stoves when given the opportunity? and

* how can stove programs be better organized and targeted to increase the likelihood of bringing these benefits to more people?

The findings presented in this paper are an attempt to answer these questions and to make recommendations regarding the future viability of stove programs. The research is based on case studies in both Asia and Africa, and on an international review of experiences in stove dissemination (see Appendices A and B). The components of the review include importance of stoves for people in developing countries, an assessment of progress and problems encourntered in stove programs, experience from field trips to review programs in many developing countries, a global survey of the nature of 137 programs, and four in-depth case sutifes. The rationale for counducting the reserch was that, worldwide, there have been hundreds of stove program implemented with mixed results. Some were quite successful, while many others floundered.

The purpose of the review is to determine if some common threads could be found among the successful versus the failed programs. This paper is based on the twelve reports producted under the project, which are listed in Appendix A. The results of the research tend to confirm some of the accepted wisdom regarding successful programs, including that programs are most successful in areas where wood or other biomass materials are scarce or expensive, while, on the other hand subsidies may aid in the distribution of stoves but may not result in actual stove use. Before turning to the findings, we will present a short background on the emergence of stove programs.

2. BACKGROUND ON THE EMERGENCE OF STOVE PROGRAMS

The development of better stoves obviously is not a recent phenomenon. Improved or efficient stoves have been developed and marketed for centuries. For example, enclosed wood-burning stoves were adopted by middle and upper income families in developed and devloping countries when access to petroleum-based fuels was a problem. As developing countries became more urbanized, enclosed wood or charcoal stoves were developed and adapted from other regions or cultures, in part to cut down on inside air pollution within homes and apartments. In some countries sheet metal was the material of choice for making stoves for the urban poor, whereas in other areas brick or clay stoves were produced. These were developed without the intervention of governnment and donors by a method of trial and error. During this period, woodfuels were relatively cheap and so efficiency was not an important factor. As the urban populations increased, woodfuel supply zones became relatively more distant from the market and prices increased, some stove makers began to improve their models and make them more efficient.

Improved stove programs that focus on energy efficiency were started in the 1970s after the large rise in oil prices. Before the oil shocks, as biomass fuels became more expensive and difficult to obtain, households in many countries were able to shift up the energy ladder to the modern fuels, as occurred in South Korea in the 1960s. Because of the increased prices and supply uncertaininties of fossil fuels following the oil shocks, developing country households ae less able to follow this course today, and some people may even switch back to the use of

biomass fuels. It seems that many people may have to rely on biomass fuels longer than was typical in the past.

Preventing deforestation was also a big issue. In many parts of the developing world, the increasing pressure on biomass resources in many cases results in deforestation and the burning of crop residues and dung (Anderson and Fishwick, 1985; Barnes, 1990; Digernes, 1977; Gorse and Steeds, 1987; Hosier and Dowd 1987; Myer, 1980; Repetto and Holmes, 1983). Although in most areas fuel gathering is not the major cause of deforestation, it can be a direct cause of the reduction in returning crop residues and dung to the soil. Deforestation, even where caused by other activities, such as expansion of agricultural lands and poor forestry practices, makes fuel gathering more difficult for households. Today we realize that the deforeatation problem is more location specific than previously assumed, and this can have significant implications for the location of stove programs. In most countreis there are regions where existing biomass use patterns are unsustainable (Bajracharya, 1983). In such areas improved cooking end-use efficiency and increased supplies are viable options to restore supplies to sustainable levels.

Higher oil prices, increasing deforestation, and talks of the impending "fuelwood crisis" spurred governments, donors, and non-governmental organizations to begin financing and developing stove programs. The principal justification was that the relative rapid changes in fossil fuel prices, urbanization, economic conditions, and population densitites were such that the natural innovation and entrepreneurial processes for stove development and dissemination were not receiving the proper price signals and other information and resources necessary to keep up with such changes.

Conventional wisdom at the time considered existing traditional, "three stone", biomass stoves to have energy efficiencies of only 5 to 10 percent. Of course, these stoves have other benefits that may explain this lack of energy effucuebctm including the need for space heating, the protection from insects provided by smoke, and flexibility for using a wide variety of fuels in diffrent seasons. Initial efforts seemed to show that fairly simple design changes could create biomass stoves with three to six times the efficiency of the simple traditional stoves. With this seemingly huge benefit as an incentive, a number of stove programms were launhed around the turn of the decade in 1980. With this as a background, we next turn to the reasons for promoting the adoption of improved efficiency stoves.

3. REASONS FOR PROMOTING IMPROVED STOVE PROGRAMS

Besides supply strategies such as imprved tree management and tree planting, there are two basic demand-side strategies that can be applied to the deforestation and fuel affordability problems mentioned in the previous section. The first is to take steps to accelerate the natural tendency for households to move up the energy ladder to the modern fuels. This might be done through making modern fuels more accessible or through subsidies of modern fuels including kerosene and LPG. Subsidies, however, create othe rproblems by encouraging wasteful use of these fuels elsewhere in the economy. Thus, to work, these fuel substitution schemes need somehow to be targeted to those households that are still using biomass, but would move to odern fuels given the proper incentives. In many urban situations, however, daily biomass fuel costs exceed the equivalent amount for derosene or LPG (Alam and co-authors, 1975). One reason people do not switch is the larger lump sum cash investment

needed to purchase petroleu based fuels and stoves.[2] In these cases, loans or subsidies for stoves rather than fuels may be an answere.

The second approach is to introduce improved stove technology as a new step in the energy ladder between traditional biomass stoves and the modern fuels. This apprach is appropriate in those many parts of the developing world where modern fuels are not available or are not affordable an people will have to continue to rely on the use of traditionalf uels. If such stoves are adopted on a large enough scale, they could reduce the pressure on biomass resources. In addition, there is another important circumstance in which it might be wise to prevent people from moving to modern fuels. In China, many rural households are moving up the energy ladder to coal, which, because of the recent opening up of the rural economy, is widely available in many areas that do not have official supplies (World Bank/University of Pennsylvania, 1991). Because of severe probmes in the coal supply sector, which are projected to become worse, the Chinese government would like to slow or even reverse this development. The Government has included improved biomass stoves as a part of this strategy.

The two clasess of benefits that are at the core of most improved stoves programs are their environmental health and the socioeconomic impacts. As indicated, the main justifications given by sponsoes for promoting improved stoves have been to alleviate pressure on the natural resource base, to use energy in a cost-effective and efficienct way, and to provide a means for the poor to reduce their high expenditures on energy. The main direct beneficiaries of the improved stove programs are women and those who are in the middle and lower income levels of society (Eckholm, 1983).

[2] The price of cooking fuels vay significantly between different countries. In some countries the price of woodfuels is competitive with modern fuels, and in others its is below the alternatives (see Barnes, 1991 for a review of wood fuel pricing issues). The situation is coplicated by government policies. For instance, in Zambia (World Bank/UNDP 1991c) subsidized electricity is cheaper than charcoal for cooking and in Burkina Faso where LPG is taxed wood is cheaper to use (World Bank/UNDP, 1986

Figure 1 & 2.

Figure 1
Fuel Expenditures Share of Urban Income
in 11 Developing Countries

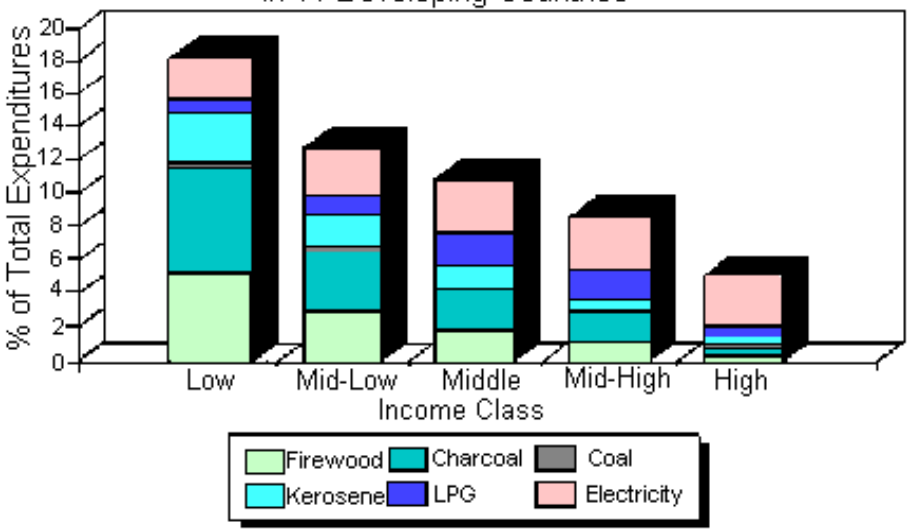
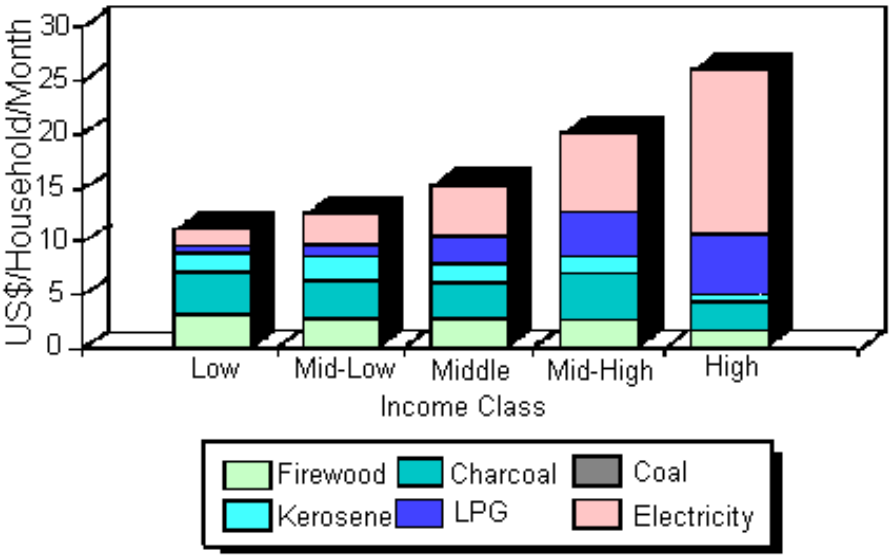


Figure 2
Urban Income And Fuel Expenditures
in 11 Developing Countries



Source: ESMAP Household Energy Surveys

Note: The countries include Bolivia, Haiti, Yemen, Indonesia, Philippines, Thailand, Cape Verde, Mauritania, Burkina Faso, Zambia and Chian.

The use of improved stoves can result in financial gains for households, either through direct cash savings for the family or through freeing women's time that can be used to earn cash income or to produce other goods and services. In particular, higher fuel efficiency lowers the cost of cooking for the urban poor and middle class people who buy charcoal or fuelwood. Recent surveys in urban areas indicate that the lowest twenty percent of the population use close to twenty percent of their income for purchasing energy, and most of the energy purchased is woodfuel (see Figures 1 and 2). Obviously, freeing some of this cash income for other uses is a substantial benefit for the urban poor. In rural areas where most people collect fuelwood, the use of more efficient stoves migh significantly reduce the time necessary for collection, especially for women. The value of the time spent collecting fuels in many instances can be significant for rural people, and especially rural women (see box 1).

The community economic and environmental impacts of adopting improved stoves also can be quite significant. In areas where wood is being harvestd fastern than it is being grown, the use of more efficient stoves to reduce demand for wood to sustainable levels is usually a ore economically viable initial option than planting new trees. It must be cautioned, however, that if wood-fired cooking is made more affordable through improved stove efficiency, people may cook longer than before because it is more affordable. Thus, the actual savings of wood may be less than the difference in efficiencies between imprved and traditional stoves might seem to promise. This is because some households with improved stoves will choose to use their stoves more, for example to boil water more often as has been observed in Sri Lanka (Bialy, 1991b). In Kenya, some households that were using other fuels switched back to charcoal when efficient stoves were introduced (Jones, 1989, p. 42). It should be emphasized, however, that even when the overall savings in wood or charcoal are small, there can be a significant improvement in welfare because people are more productive with the same amount of fuel.

Box 1

Some Benefits of Stoves for Women and Their Families

Many of the benefits of the stoves programs directly affect the lives of women, especially those in the lower and lower middle classes who cook with woodfuels. Two cases presented below illustrate these benefits for rural and urban areas.

Rural Nepal

For rural areas he benefits of improved stoves can be the savings f fuel collection time. In a recent report on the hill areas in Nepal, it was estimated through a survey that women spend about 2.5 hours per day collecting fuelwood, fodder, and grass. The general finding is that deforestation or lack of access to fuelwood resources has a negative impact on the amount of time available for agricultural labor. With more time required to collect a standard headload of wood--an indicator of deforestation--the collection time in high deforestation sites increased by 1.1 hours per day, while time spent on farming decreased by about one hour per day. The consequence is that women work somewhat longer hours and labour is drawn away from agriculture. Although these results represent a severe case it is evident that time saved in collecting fuel could be used for productive agriculture.

Urban Sub-Saharan Africa

The benefits for women in urban areas include reducing cash expenditures on wood fuels for the family and greater convenience. In Miamey, Niger the typical energy used in a traditional stove is .57 kg per person per day, while the wood consumed in a family that uses an improved stove properly is about .42 kg per person per day. The total family savings for a year is about 335 kg of wood, valued at 5,360 CFA per year (15.3 dollars). In Rwanda the savings are much greater. The typical consumption of charcoal for an average household went from .51 kg per person per day to .33 kg per person per day. This means that in a year a family could save about 394 kg of charcoal worth 6,310 Rwanda Francs (84.1 dollars). In Kenya, average daily charcoal consumption declined from .67 kg per person to .39 per person with an improved stove. This adds up to a total yearly savings of 613 kg per family, with a value of about 1,170 Kenya shillings (64.7 dollars). Such savings are substantial for families in countres like Kenya, Rwanda, and Niger where average incomes per person range from just 300 to 370 dollars per year. In addition to the cash savings, the stoves also are attractive, easy to use, affordable, and less polluting.

Sources: Jones (1989), Kumar and Hotchkiss (1988), World Bank/UNDP (1991a), World Bank/UNDP (1991b)

For people who cook indoors with wood in an unventilated or partially ventilated kitchen, the introduction of improved stoves with chimneys or other means to reduce exposure to the health-threatening pollutants found in biomass smoke is a significant benefit. Studies in recent years have associateds a number of health problems with such smoke exposure (see Box 2). In addition, because of greater insulation, burns are less likely with most improved stoves, both for the cooks and their children. A safer and healthier environment--particularly for women and children--may be one of the most important potential contributions of improved stoves to the cramped living conditions experienced by many poor people.

Box 2

The Health Effects of Biomass Smoke

Biomass fuels such as wood, crop residues, and dung release large amounts of air pollutants when burned in simple household stoves. The pollutants found in biomass smoke are respirable particulates, carbo monixide, nitrogen oxides, formaldehyde, and hundreds of other simple and complex hydrocarbons. In many parts of the world, these pollutants are releaxed from stoves in fairly unventilated situation inside homes or in enclosed courtyards. As has been shown in a growing number of air pollution monitoring studies, the resulting human exposures to these pollutants often exceed recommended World Health Organization levels by facors of ten, twenty, or more. Recently some studies of the effects of this smoke have been completed. Althrough there is some conflicing evidence, many of the new studies point to biomass smoke as a cause of health problems.

Acute Respiratory Infections in Children

After diarrhea, acute respiratory infections are the chief killers of developing country children, and are responsible for more episodes of illness than any other disease category. From studies in developed countries, it is known that acute respiratory infections are caused by urban environmental pollution and indoor tobacco smoke at levels that are some 10-30 times less than those levels typically found in village homes.

The most interesting studies now available were completed in Nepal, Zimbabwe, and the Gambia. The Nepal study examined about 240 rural children under 2 years of age. The children were examined each week for six months, and a strong relationship was found between the reported number of hours per day the children stayed by the fire and the incidenc of moderate and severe acute respiraotyr infections. In Zimabwe, 244 children less than three years old that reported to a hospital with acute respiratory prlbmes were compared with 500 similar children reporting to a Well Baby Clinic. The presence of an open wood fire wqas found to be a significant risk factor for the sick children. In a study of 500 children under 5 years of age in the Gambia, it was foudn that girls who were carried on their monther' backs as they cooked in smoky huts had a risk of acute respiratory illness that was 6 times higher than other children, a risk factor substantially higher than that from parental smoking. At present these findings are only suggestive, because there are so many other risk factors involved.

Chronic Lung Disease and Cancer

Chronic lung disease and cancer, for which tobacco smoking is the major risk factor in developed countries, is also known to be an outcome of excessive air pollution exposure. However, the risk factors of such diseases are difficult to measure because the exposures that cause the ill-health occur many years before the symptoms appear. Nevertheless, there are studies in Papua New Guines, India, and Nepal showing that non-smoking women, who have cooked on biomass stoves for many years. exhibit a higher prevalence of chronic lung disease than might be expected or than similar women who have had lower levels of exposure to cooking smoke. Indeed, in rural Nepal about 15% of non-smoking women had chronic bronchitis, a high rate for non-smokers. For cancer, the results are more mixed. While a study in Japan found high rates of cancer in women who had previously used wood as a fuel, women's lung cancer rates in rural areas of developing countries are low. More research is necessary because both of these diseases develop long after take long after exposure to pollutants.

In summary, there is growing scientific evidence to support the numerous anecdotal accounts relating high biomass smoke levels to important health effects. In addition to the respiratory diseases discussed above, exposure to cooking smoke also seems to affect eye problems and to cause difficultires for newborns. More researh is needed, however, before quantitativees estimates of how much ill-health would be reduced by smoke reduction activities such as those made possible by improved stoves.

Source: Smith (1987, 1991a)

More recently, there have been growing concerns about the implications of changes in energy supply on greenhouse gas emissions and the consequent chance for global warming. Improved biomass stoves reduce the emissions of carbon dioxide to the atmosphere. Indeed, sustainable biomass harvesting combined with high efficiency combustion seem to be one of the most "greenhouse friendly" energy technologies presently available. As explained in Box 3, however, it is not so well recognized that the potential benefits of improved biomass stoves are even greater than what is indicated by an examination of the carbon dioxide emissions alone. Because traditional biomass stoves often have low combustion efficiencies, they can release large amounts of the products of incomplete combustion, most of which, like carbon dioxide, are also greenhouse gases, but with even higher global warming potentials. Thus, the potential global warming benefit of improved stoves is that increase combustion efficiency is likely to be substantially greater than has been recognized.

Apart from the benefits described above, improved stoves can have many important and much appreciated social benefits (see Jones, 1989, pp. 39-41 for a list of benefits). It may save cooking time because of a higher power output and a higher thermal efficiency, or because it is easier to light. It may reach the desired temperature more quickly than conventional stoves and maintain the critical cooking temperature longer. Therefore, the cook may save time by preparing the meal more quickly and perhaps by tending the fire less. Improved stoves often have a much better appearance or have other attributes such as two burners, a mechanism to control the power output, spare parts for quick repairs, and a handle for carrying. In several countries improved stoves were considered by the users to be more modern than the traditional stove and may be looked on as a status symbol as well as being a better cooking device. For woodstoves, smoke can not only be unhealthy, but it discolors walls and clothing. Finally, stove programs that encourage the participation of local women have been an effective way to enhance their general status, a result with important implications for many other areas of social development.

Box 3

The Total Global Warming Potential of Biomass Combustion

Carbon dioxide, the principal gas produced by biomass combustion is the most well known greenhouse gas, but it is by no means the only one. Essestially all the products of incomplete combustion (PIC) produced in biomass fires are also greenhouse gases. These include methane, carbon monoxide, and higher hydrocarbons, which are actually even more powerful greenhouse gases than carbon dioxide per gram of carbon emitted. Indeed, if carbon from fuel combusion is to go into the air, carbon dioxide is just about the least damaging form. However, if improved stoves are disseminated whihc are characterized by efficient combustion, then mainly CO_2 and H_2O are emitted.

Unfortunately, the combustion efficiency of traditional biomass stoves is very poor. It is not uncommon, for example, for well more than 10% of the carbon to be released as PIC rather than caron dioxide, which would be the only product if combustion was complete. Because PIC on average have higher Global Warming Potentials (GWP) than carbon dioxide, the total impact can be substantially higher than would be indicated by an evaluation based on carbon dioxide alone.

There are several tentative , but potentially important policy implications of these findings. First, the overall greenhouse gas benefit of changing from a traditional to a clean-burning improved biomass stove may be much larger than previously estimated, potentially provinding an additional incentive for international support of improved stove programs. Second, in palces were fuelwood is not harvested in a sustainable manner, there can be a greenhouse benefit in shifting up the energy ladder to kerosene or LPG, or improving the sustainability of fuelwood use. Third, the typical, inefficient charcoal kilns used in developing countries give off substantial PIC emissions. The resulting total greenhouse impact of some charcoal fuel cycles may be much greater than a comparable fuelwood cycle, which gives additional impetus to improve kiln efficiencies and may also argue for efforts to encourage charcoal users to adopt other fuels.

The general impact of these findings is that the GWP of biomass stoves may be larger than has been recognized due to the potential higher PIC emissions. It is known that they rob households of some of the energy contained in the fuel and impose health problems on the households. On the other hand, much of the GWP is offset, because much of the fuelwood used in households comes from a renewable resource. Nevertheless, the presence of PIC gases emitted by traditional stoves provides another incentive to introduce stoves designed to burn wood with efficient combustion.

Source: Smith, 1991b; Floor and van der Plas, 1992

Offsetting some of th above benefits is the fact that some improved stoves have been known to be much more temperamental than traditional stoves. A common problem is for designers, in their desire to reduce heat loss, to have such a small hole for adding fuel. This requires the cook to spend much time in cutting the wood so that it fits in the hole (Openshaw, 1982). Some of the desing changes made to increase heat transfer efficiency through decreasing air flow can actually increase smoke emission, while other changes made to reduce smoke exposures by introducing chimneys can act to reduce efficiency. Thus, a balance must be sought among the perceived and real social benefits, which depend on the nature of the stove that is introduced, and the cooking customs of those who use it. In some areas, there just may not be a balance between such factors and the capability to produce affordable stoves.

To summarize, the main justifications of the improved stove programs have been economic, social and environmental. The use of an impproved biomass stove saves money and time for people, mainly women who use the stoves. Their use can help alleviate the environmental problems and economic externalities involved in over-harvesting trees. The programs can also have important soical and health benefits as well, especially for women and children. Each program will have its own unique mixutre of benefits, which should be spelled out in advance, depending on local ocnditions. In this way, monitoring and evaluation techniques can be tailored to increase the probability of stove adoption[3]. There is no universal solution. This brings us to the point at which we need to examine the elements that make up successful and unsuccessful stove programs.

4. GENERAL LESSONS FROM STOVE PROGRAMMES

The wide diversity of stove programmes is an outgrowth of the participation of many governments and donors in funding projects or small stove components of other projects (see Appendix B for a partial list of programmes). As a consequence, there were many different kinds of stove interventions, with some directed towards rural areas where biomass is collected and others geared towards urban areas where the woodfuel trade is commercialized. In addition, the programmes for stoves that conserve wood and other biomass can be quite different from those that conserve charcoal.

In the early programmes it was assumed that if improved stoves were presented to people, they would be adopted quickly and the initial intervention would lead to self sustaining programmes. Indeed, the work on stoves continually refers to "stove dissemination", which seems to naively imply that the improved stove is far superior compared to the traditional stove just because efficiency is improved. Because of this limited thinking, many programmes have failed (for critical reviews of these early efforts, see Agarwal, 1983; Foley and Moss, 1983; Manibog, 1984; Baldwin and co-authors, 1985; Gill, 1987; Krugmann, 1987).

The lessons learned from failed and successful programmes can be used to ensure that future efforts will have a better chance of success. In particular, the chances of success are enhanced in situations where people have an explicit need to save fuel, for stoves which are a significant improvement over the local traditional stoves, and in areas where stoves can be made readily available by local industries or artisans at affordable prices (see Box 4).

Perhaps the most pervasive reason for many of the early failures was the uncritical approach taken to the apparent improvement in stove efficiencies that was "proven" in laboratory or other controlled settings. As mentioned above, too many programmes started with unrealistic expectations that a successful improved stove should easily decrease fuel consumption by factors of three to six. Although such claims are still heard sometimes, most

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[3] During the period of the study reported here, two other international groups have been engaged in efforts to improve the monitoring and evaluation (M&E) approaches used for improved cookstove programs. The Food and Agriculture Organization (FAO) has sponsored PRINT e development of guidelines for M & E (Joseph, 1990), which have been reviewed and may be revised. With funding from the German Government, the Gesellschaft fur Technische Zusammenarbeit (GTZ) and the Intermediate Technology Development Group (ITDG) have undertaken to develop a draft of M & E guidelines (Crewe, 1991) and test them within a number of ongoing stove dissemination programs in developing countries (Klingshirn, 1991). These guidelines are to be tailored to specific economic, social, and environmental objectives, sucha that each stove program can choose a mix of objectives to suit their needs. The principal investigator's three projects (ESMAP/EWC/UNDP, FAO, and GTZ/ITDG) have been in close contact and have attempted to avoid exessive overlap.

people in the stove community now agree that 50 percent should be considered a major achievement. Most stove programmes should be content with savings of 25 percent, or even less.

This profound change in perception has several causes. First, more consistent measures of efficiency are now being applied. Second, traditional stoves used by women in fuel-short areas often have efficiencies substantially more than 10 percent. Finally, stoves used in real households never perform as well as those built and evaluated in laboratiories or other controlled situations. This unrealistic expectation led to much sloppinesss in the implementation of stove programmes. For example, it was assumed that such huge improvements in efficiency would make the stoves irresistible to householders and that programmes would be easy to monitor, with no special sampling or statistical techniques needed to show success.

Box 4

Stove Programmes: Possible Reasons for Success or Failure

Reasons for Success	*Reasons for Failure*
* Regions where traditional stove and fuel are purchased or fuel is hard to collect.	* Regions where traditional fuel or stove are not purchased and fuel is easy to collect.
* People cook in environments where smoke causes health problems and is annoying.	* People cooking in the open and smoke is not really a problem.
* Market surveys are undertaken to find out if, where and what kind of market exists for improved stoves.	* Outside experts determine that improved stoves required.
* Stoves are designed according to consumer preferences, including testing under actual use conditions.	* Stove designed as a technical package in the laboratory ignoring customers preferences.
* Stoves are designed with assistance from local artisans.	* Local artisans told or even contracted to build stoves according to specifications.
* Local or scrap materials used in the production of the stove, making it relatively inexpensive.	* Imported materials used in the production of the stove, making it expensive.
* The production of the stove by artisans or manufacturers is not subsidized.	* The production of the stove by artisans or manufacturers is subsidized.
* The stove or stove components are mass produced.	* The critical stove components are custom built.
* Similar to traditional stove.	* Dissimilar to traditional stove.
* The stove is easy to light and it accepts different sized wood.	* The stove is difficult to light and requires the use of small pieces of wood.
* Power output of stove can be adjusted.	* Power output cannot be easily controlled.
* The government is divorced from production process, but is involved in dissemination, technical advice, and quality control.	* The government is involved in production process.
* The stove saves fuel, time, and effort.	* The stove does not live up to promised fuel savings under real cooking conditions, and also does not save time or effort.
* Donor or government support extended over at least 5 years and designed to build local institutions and develop local expertise.	* Major achievements expected in less than 3 years and all analysis, planning, and management done by outsiders.
* Monitoring and evaluation criteria and responsibilities chosen during planning stages according to specific goals of project.	* Monitroing and evaluation needs are not planned and budgeted, or criteria are uncritically taken from other projects or not explicitly addressed at all.
* Consumer payback period is 1-3 months.	* Consumer payback is period of more than 1 year.

It would not be easy or fruitful to assign blame for this situation, because it resulted from actions of many different people, all with the best of intentions. Indeed, perhaps it was an inevitable step in the progress of stove programmes, necessary to entice a enough people into the field to eventually bring success. Whatever the judgment, the definition of success, itself, now has a substantially different color than in the early 1980s. Its quantifiable goals, such as changes in fuel use, are more modest and a range of qualitative indicators, such as improvement in convenience, have more legitimacy (see Clark, 1985; Caceres and coeditors, 1989; Viklund, 1989).

The Stove Market and Consumer Preferences

Stove programmes have a better chance of succeeding in areas where *people already buy both the fuel and the stove* (see Box 4 and Box 8), generally in urban and peri-urban areas. In many rural areas, fuelwood is not difficult to gather and there is no pressure to conserve fuel. In some rural areas that have few remaining trees, however, such as those areas where fuelwood has already been harvested for urban consumption or in very arid regions where trees grow back very slowly, rural people may be interested in saving fuel because it is not readily available from the local woodlands. It is a sign of shortage when people, especially women, are spending increasing amounts of time collecting fuelwood or have switched to crop residues or dung, which, in addition to being less convenient, efficient, and clean, usually have alternative uses as soil conditioners. Many programmes have failed because the target groups have sufficient supplies of wood, or do not perceive shortages, and thus people see no reason to adopt improved stoves.

Some stoves are designed in the laboratory and manufacuted without field testing to see if they perform the necessary tasks for persons who prepare meals. An early stove programme in East Africa is an example of the difficulty in producing a viable stove in the laboratory without extensive field tests (Openshaw, 1982, 1986). In this stove the pan sits inside of an insulated collar. As a consequence, various sizes of stoves had to be made to fit different pan sizes. In addition, the insulation and extended collar also made the stove heavy. Because of the efficient insulation, the inside metal became extremely hot and did not last very long because of metal fatigue.

Some programmes have had difficulty because they assumed that if a stove is adopted in one part of a country, then it will be acceptable in other areas in spite of significant regional differences in cooking habits and needs. A good example of this is a Nepalese stove that was distributed in all areas without adapting it to the different regional needs (Pandey, 1991). Although the extension component of the stove programmes was considered quite good, the problem was that the stoves were not technically suited for the various environments present in Nepal. Another problem was that over a 9-year period about 18 different projects were involved in stove dissemination, although coordination has since improved (Shrestha and co-authors, 1991).

New stoves should appeal to the needs of consumers because people generally will not adopt an innovation without a significant reason. Since women most often use stoves, the stoves should be easier rather than harder to use than traditional stoves. In some cases, stoves that are similar to traditional stoves in appearance and function have been adopted quickly by consumers. Although this is not a definite requirement, the point to be made is that if improved stoves have complicated features or require that the wood be cut into small pieces to be accommodated in a restricted fire box, people may not be inclined to use them. For example, in Kenya a custom-made improved wood stove that took about 2-3 days to install was not successful because women did not have the time or the tools to cut the wood in small pieces to fit into the fire box (Openshaw, 1982). Many people that adopted the stove would end up enlarging the fire box, gladly sacrificing some energy efficiency in doing so. On the other hand, the new Kenyan charcoal stove, although a distinct improvement, was similar in function to the existing stove and was quickly adopted (Karekezi and Walubengo, 1989).

The price of stoves can be a significant barrier to their adoption. Improved woodfuel stoves, which are typically about twice as expensive as the local traditional stoves, could be quite expensive for the poor. Although in the long run an improved stove should save money, people may be unable to afford the initial cash outlay for purchasing it. In most of Africa, surveys point to the fact that the middle-income families have adopted the improved stove much more quickly than poor families (Joness, 1989). This is one areas where governments and donors could assist, but generally subsidizing stoves is a risky way to promote them. To be attractive to low income households, improved stoves must have a quick payback period. In urban Rwanda--where the price of charcoal is quite high--the payback period for improved stoves is less than one month (see Box 5). High wood prices or scarce supplies of wood increase the likelihood of stove adoption. For the same reason, stoves should be as durable as traditional stoves, with replacement parts such as grates readily available and inexpensive.

For assessing consumer needs and programme viability, surveys, consumer panels, and other techniques should be undertaken to determine, existing patterns of stove use, the most important factors that people consider when pruchasing new stoves, the person who makes the decision to purchase a stove, and whether income and fuel savings will provide adequate incentives for stove adoption (Baldwin, 1987). The improved stoves should be designed around the utensils and the typical food dishes that are prepared. Stoves must be field tested to make sure that they are acceptable to the prospective consumers, especially women. They should be modified or redesigned to meet regional requirements (Stewart and co-authors, 1987). In the stove development stage, the stoves must be monitored to determine how to best meet the needs of those using them. These objectives are only met with the active participation of users, principally women (Cecelski, 1984; Tinker, 1985; Agarwal, 1986; Sarin, 1989). Differences among programmes have proved to be even more important than differences in local conditions in explaining the level of stove dissemination (Fraser, 1987).

Box 5

The Financial Benefits of Improved Stoves in Urban Rwanda

Rwanda is a country where urban people cook with charcoal. Because of extensive use of fuelwood in rural areas, charcoal accounts for a small percent of total energy consumption in the country. However, it is the main urban cooking fuel, accounting for 80-85 percent of total energy demand. The reasons urban households use charcoal are that existing wood resources are distant, and charcoal is perceived to be a more modem fuel. Compared to many other countries in Africa, the charcoal price in Rwanda is relatively high. As a consequence, the potential savings for adopting an improved stove are dramatic. The fuel savings during the first month's use of an improved stove actually pay for the stove. With the incremental investment of 1.48 US dollars for improved rather than traditional stoves, a family saves 114 US dollars over 18 months. These figuese are for the present value of the investment and savings.

The figures presented below are based on surveys of existing stoves under actual use by families in ruban areas. A traditional stove in Rwanda lasts about 9 months, and an improved stove will last about 18 months with some maintenance. The cost savings were calculated over an 18 month period, or the useful life of one improved stove. Since most urban families in Rwanda use two stoves, the calculations for both the improved and traditional stoves are based on 2 stoves.

Financial Comparison of Costs of Traditional and Improved Stoves for an Average Urban Family in Rwanda, 1991

Presens Value of Cosis over 18 month lifetime of 2 stoves	*Imbabura Traditional Stove*		*Rondereza Improved Stove*		*Cost Savings of the Improved Stoves*	
	Francs	*US$*	*Francs*	*US$*	*Francs*	*US$*
Cost of Two Stoves	777	10.09	891	11.57	-114	-1.48
Cost of Fuel	25,591	332.35	16,694	216.82	8,896	115.54
Total Costs	26,368	342.44	17,586	228.39	8,782	114.85

Note: The discount rate used in the analysis is 12 percent. The dollar figures are somewhat high because a short time after the surveys the currency was devarued from 77 Francs to 125 Francs per U.S. dollar, and the price of charcoal did not change during this period. In addition, the survey involves average fuel savings between households using either improved or traditional stoves, rather than before and after testing.

Source: World Bank/UNDP (1991b)

Improved efficiency has been the main goal of many programs, but it is not the only goal. Other improvements may incorporate heat control, usually a door to modify air inflow, removal of smoke with the use of a chimney, safety features including insulation to cool outer surfaces, and a more attractive finish. This brings up the key and quite complicated question of the process by which improved stoves are designed, manufactured, and marketed.

Stove Design and Manufacturing

Even though use of biomass energy is nearly as old as the human race and has been the subject of scientific attention for hundreds of years, there is still much to be learned about biomass combustion. In particular, reliably achieving high fuel efficiency and low emissions, with low-cost devices that meet local cooking needs has turned out to be a much more challenging technical goal than originally thought. In spite of the relatively small amount of research and development funding that has been available (Chomcharn and Gujral 1991), however, significant progress has been made in understanding the most important techynical design principles (Prasad and co-authors, 1985; Baldwin 1987; Steward and others, 1987; Nijaguna and Uppin, 1989; Bussmann, 1990).

The involvement of stove makers and users from the outset is critical for the success of stove programs. In the first part of this section, the process of designing the stove is discussed, followed by an analysis of factors involved the stove manufacturing process.

Although with engineering principles, much has been learned about involving local builders and users in the stove's design. Because improved efficiency may make the stove too complicated to produce profitably, the artisan or stove maker should be involved in the design. The improved Zambian charcoal stove had a straight sliding door that took eight different pieces of metal to make, whereas a hinged door, albeit with not as good air control only had four metal peices and was much easier to assemble (Walubengo, 1989; Zambia, Department of Energy, 1988). Also the ash box occupied two-thirds of the stove when in fact the amount of charcoal ash is negligible. A small ash box built on legs would have saved about one-third of the metal. This stove was designed in the laboratory without inputs from the arttisans. Now artisans are modifying it. Thus, the stoves must be easy to produce to have a good chance of success.

The fuel savings that can be attained in a laboratory often have little relationship with savings that are possible under actual field conditions. A 10 to 20 percent efficiency improvement in controlled settings is likely to turn out to be a negligible improvement when the stoves are used under normal household conditions. Also some initial efficiency improvements may come from better aand more careful cooking practices, often a result of the stove dissemination efforts themselves, rather than from any stove improvements. It may take a 30 to 50 percent improvement in controlled settings to be sure of a substantial energy savings in the home. The first Lorena-type stoves introduced into Central America, for example, did not save much fuel and most were abandoned, although some were retained because of their convenience and smoke reduction.

Improved stoves have to compete with traditional stoves, which are invariably made of local or scrap material (Baldwin, 1987). Clay stoves often use local material, but they sometimes require machines in the manufacturing process. If scrap metal is used, the stove appearance could be improved by apinting. The stove makers in Thailand made the outer metal cladding from misprinted cola can sheets which were imported very cheaply (Openshaw, 1979). The improved Gambian stove, however, was made from heavy gauge, imported sheet steel and thus for most people it was too expensive to buy.

In designing stoves, it is crucial to consider the needs of the main consumers, namely women. The different styles of cooking in various countries dictate that there will be different stove designs. Insuring that the design meets the needs of the people using the stoves means that it is a good idea to introduce an improved stove design into households on a trial basis early in the lprogramme. Over time, the design can be modified and improved (Hyman, 1987). An example of a programme that ran into difficulties because it did not take into consideration

consumer needs was the Kenya stove that required wood to be cut into very small pieces (Jones, 1989). Women did not even have the necessary tools to split the wood to make it fit into the improved stove. Because women are often short of time due to the demands of both household and informal lobour, a stove that requires more time to light and manage probably will not be adopted.

Turning to stove production, mass produced stoves by a group of individual artisans or a small stove factory will lead to much quicker stove adoption compared to custom-built models. A custom-built model may take one to three days to install and the rate of dissemination depends on the number of trained installers. A metalsmith can make many more stoves per day and a lpotter can produce batches of 50 to 100. Thus 2500 to 5000 stoves can be made by 2-3 people each year, whereas to produce the same number of custom-made stoves would require about 20-40 trained installers. This is why the stove programme in China was initially slow to take hold, although now they are moving to mass produced inserts and parts (Gu and co-authors, 1991).

In addition, it is difficult to maintain the quality control necessary to reliably achieve fuel savings with home-built stoves. This is certainly true for stoves built by the householders themselves and is even likely to be so when trained installers are used. Small changes in the stove dimensions, for example, can lead to big drops in efficiency. As a result, most stove programmes in the world, including the two largest in China and India, are moving toward centralized, artisan production of the interior parts of the stove where the dimensions are most critical (Qiu and co-authors, 1990; Ramakrishna, 1991a; Tata Energy Research Institute, 1987, 1989; Operations Research Group, 1989). Installers and the householders still have an important role in building the rest of the stove around these critical parts, which are usually made of ceramic or metal.

The artisans or stove producers must make the same profit or more from an improved stove compared to a traditional one. If more effort is required to make an improved stove, then more oprofit is required. The profit motive is often critical to a successful stove programme, even in China where many stoves are made in locally organized companies. It has been found that if artisans are involved directly in the sale of the stoves, there is a better chance of success than if artisans are given orders to produce a given quantity of stoves without being involved in the selling or distribution. For example, in many countries artisans extend credit to make the purchase of stoves possible, or they may demonstrate the stoves as a way to sell them. Two contrasting programmes illustrate this point. In Tanzania, the stove makers were involved in the sale of stoves and the programme has been quite successful (Kinyanjui, 1991) while in Botswana, the stove producers were paid by the government on a piece meal basis, and as a result the government is now storing many of the stoves that have been produced (Openshaw, 1986).

The common theme in many successful programmes is that the stove makers have been independent entrepreneurs actively participating in the design and even selling of stoves. Although not requireing great subsidies, they generally need technical assistance, both in the design of the stove and in marketing the stoves to local people. A principal role of governments and donor agencies in successful programmes has been in technical support and assistance in determining where market demand is strongest, which is the topic of the next section.

The Role of Governments and Donor Agencies

Usually stove programmes do not need a great deal of money from donors or governments, but they do require a long-term commitment for project continuity. Answering a global survey, the various stove programmes examined indicate that the total amount spent on 137 programmes was about 20 million U.S. dollars spread over 5 years (Ramakrishna, 1991b). Even the huge Chinese programme and the greatly subsidized Indian programme have not spent large amounts by most standards. Programme costs per stove run from less than 2 dollars for the Chinese programme to a somewhat higher cost for the average non-Chinese programme. For example in India the costs are just over $4.00 per stove. This might be compared to the typical cost to utilities for installing the barest minimum electrical capacity (100 watts) of hundreds of dollars per rural household.

From an institutional lpoint of view, the programmes that have had the greatest success are those where the government was not involved in the production or sale of the improved stove. China and India, which have the largest stove programmes by far, illustrate this point dramatically (see Box 6). Central planning and reliance on numerous layers of bureaucracy have hindered many programmes in India (Ramakrishna, 1991a), whereas small inputs for vital technical and management support combined with local stove production in China has brought much success (Gu, 1991). India, however, has been able to learn from its experience and has been modifying its programme accordingly. On the basis of such past experiences, the objective of any improved stoves programme should be the promotion of a self-sustained dissemination of improved stoves, where possible, using existing commercial distribution and retail marketing channels.

Governments and donors can assist in formulating a policy framework that will provide incentives to private sector operators to engage themselves in the production, distribution, and sale of improved stoves. The elements of such a policy framework would include criteria for approving stove projects, credit facilities for stove makers, facilitation of availability of raw materials, and promotional support. In Rwanda, the Government provides promotional support to stove programmes and is preparing a household energy sector policy that will include quality criteria for stoves that may be sold (World Bank/UNDP, 1991b). Authorities also can monitor the implementation of the policy framework (see Box 7). The monitoring would include fuelwood consumption impact surveys and stove quality control tests.

Box 6

Comparison of Stove Programmes in India and China

Between 1982 and 1990, the Chinese National Improved Stoves Programme reported the installation of improved stoves in over 120 million rural households. These are mainly biomass stoves used for cooking, but they included dual use stoves for cooking and heating in the Northern States where temperatures are very low during winter. Perhaps as many as 90 percent of total improved stoves installed worldwide were installed in China. Improved stoves are quite affordable, and the government contribution is very low compared to some other lprogrammes. An improved stoves in China costs about 45 yuan (9 dollars), while the government contribution to the lprogrammes averages about 4.2 yuan per stove (0.84 dollars). Alothough early programmes experienced problems, the benefits of more recent improved stove programmes in China have been substantial.

The Indian programme, initiated in 1983, is called the National Programme on Improved Chulhas. So far, about 8 million improved stoves have been disseminated to rural households, and the target for this year is 1.8 million. The stoves have a minimum 50 percent government subsidy or about 70 rupees (4.30 dollars) per stove. Although the dissemination levels have been impressive, there is some evidence from follow-up surveys that only about one-half of the improved stoves are still in use. Some reasons for discontinuing their use are that the stoves did not really save energy, that they did not eliminate smoke, and they were incompatible with cooking habits. Other surveys found that adopters felt that they were consuming less energy, and there was less smoke. Obviously, such mixed perceptions indicate that there must be a wide diversity of results in implementation of the programme.

Several lessons can be learned from the two stove programmes. The greater success in China can be attributed to programme design and implemintation, including the following factors:

China	*India*
* *The programme concentrated efforts on areas of greatest need, and selected lpilot countries with biomass fuel deficits.*	* *The programme was implemented country-wide, resulting in a dispersion of effort and a watering down of financial resources.*
* *Director contracts between the central government and the country cut out much bureaucracy. This arrangement generated self-sustaining rural energy manufacturing and service companies that provide installation and servicing of stoves and other energy technologies.*	* The administration of the programme is cumber some, moving from the center to six regional offices, to the state, to the district, and finally to the taluka, where the stove programme is just one among many national programmes being implemented locally by the same people.
* Local rural energy officers are in charge of technical training, service, implementation, and monitoring for the programmes.	* Monitoring was a real weakness in early programmes, where the responsibility fell on local officials with many other responsibilities. Recently, actions have been taken to correct this problem.
* Recent Chinese improved stoves are not only suitable for fuel savings, but have been designed for convenience and attractiveness. This highlights the lessons learned from problems in early programmes that mainly stressed fuel savings.	* In India there have been a wide variety of attempts to integrate efficiency and convenience, but they have suffered from the top down structure of the stove programme.
* Stove adopters pay the full cost of materials and labour. The government helps producers through stove construction training, administration, and promotion support.	* Stove adopters pay for about half of the cost of stoves, while the government pays the rest. As a consequence, the producer's incentive to construct stoves is oriented towards the government.

Source: Ramakrishna(1991a), Gu & coauthors (1991)

Governments and donors also can provide stove makers or stove sellers with technical and managerial assistance. This would include support for applied stove research and testing of clay and insulation materials. In China and India, both governments provided stove programmes with extensive applied research inputs on stoves and on stove-making materials. A major part of the difficulty in the Nepal programme, in contrast, has resulted from too little resources being available for technical assistance to the programmes (Shrestha and co-authors, 1991).

Again donor or government support may be required to assist in the following areas:

* Surveys and interviews to determine the groups that would find the greatest need for improved stoves;
* Designing improved stoves with the collaboration of the artisans and users;
* Testing materials for stove makers, especially clay and stove insulation;
* Giving advice to stove makers particularly about budgeting, marketing and quality control, with the possibility of issuing seals of approval for efficiency;
* Providing or facilitating loans to stove makers if necessary;
* Promoting stoves through demonstrations, ralies, radio and TV;
* Undertaking field surveys before and after stoves have been introduced to determine energy savings;
* Orgnaizing training programmes in stove manufacture;
* Keeping the stove makers abreast with developments within the country and in other countries and distributing this information freely to all interested parties; and
* Promoting research to further improve stoves, pots, and pans.

In parallel, advice can be given to producers, transporters and traders in biomass fuels to improve their productivity.

Perhaps the most important role for governments and donors is in institution and personnel building. The most important outcome of outside assistance should be the creation of the institutions and trained people necessary to sustain the stove promotion efforts. All the skills once needed from the outside, including economic analysis, technical research, stove and promotion design, market evaluation, and training should be place.

Box 7

Conditions Favorable and Unfavorable for Stove Adoption

	Fuel Gathered	*Fuel Purchased*
Stove Constructed by Family	* Most unfavorable area for stove adoption unless fuel deficit is perceived.	* Somewhat favorable for stove adoption.
	* Subsidies may be necessary.	* Offer incentives or partial subsidies.
	* Long term effort and extended external involvement is necessary. Short term favorable results should not be expected.	* Fuel price should reflect full value of biomass resources.
		* Assess potential for interfuel substitution.
Stove is Purchased	* Somewhat favorable area for stove adoption.	* Most favorable area for stove adoption.
	* Encourage conservation of biofuels through education of environmental benefits.	* Commercialization of improved stove should be possible.
	* Determine alternative uses of biofuel resources.	* No subsidies should be considered for stoves or fuel.
		* Assess potential for interfuel substitution.

Source: Smith and Ramakrishna (1991); see also Karekezi and Walubengo, 1989; Fraser, 1987.

In addition, international donors can serve an important role in facilitating information exchange on the technical and managerial aspects of stove programmes. A common complaint about past donor assistance, for example, has been that survey and other research done in the context of a lparticular stove lprogramme has never been put into a form that makes it easily available and useful for other programmes. This has resulted in the frustrating paradox that senior management of donor organizations feel that they have already funded enough research, but programme managers and stove designers feel a strong need for more. Every donor-assisted programme should have funding available and staff designated for bringing out information in a timely and accessible manner.

The final issue involves the advantages of non-governmental organizations in implementing stove programmes compared those of governments. Stove programmes generally involve small amounts of money, and consequently there has been a tendency in

many stove programmes to implement small projects through non-governmental organizations. The advantages that non-governmental organizations bring to stove programmes are that they are not dominated by large bureaucracies, they are quick to react to problems, they are committed to energy conservation, and they are sympathetic to the main wood stove users, including rural women and the urban poor and middle class. However, these very strengths have caused some lproblems. An example involves the stove projects in nepal, where the involvement of as many as seven different institutions has lead to a fragmentation of effort, a problem now being remedied (Shrestha and co-authors, 1991). By contrsast, the non-governmental organizations have had many successes in India, but with a few exceptions the scope of their involvement has generally been with small, local programmes. In China the stoves programme has functioned well without any involvement of non-governmental organizations. Finally, in Kenya, a rural woodstove programme became successful in forging close links with an existing government extension agent network of home economists (Klingshirn, 1991).

These are a few examples of ways that governments and donors can support stove programmes, without resorting to massive subsidies of the stoves themselves. Past programmes indicate that this support can be at modest levels, but the effort must be sustained over a long period (at least five years and probably more) to reap maximum benefit from the financing. The conclusion is that the form of organization may not be as important as the long term commitment of funds in an integrated way, rather than the short term bursts of aid from many different donors that has characterized many programmes.

Is there a Role for Subsidies?

Regarding subsidies to stove programmes, donors face a dilemma. On one hand they want to promote projects that make economic sense and can be operated through private markets, but, on the other hand, they want to address the needs of the poorest groups that would not otherwise be helped. To use potential for commercialization as the only major criterion for locating stove programmes however, would seem to lead to the rather illogical conclusion that the best projects to fund would be those in areas where self-initiated improved stove development and marketing was just about to occur. The donor then steps in with a bit of up front funding, but basically only slightly accelerates what was about to happen anyway.

Although it is certainly easier to initiate a self-sustaining stove programme in areas where people buy stoves and fuels, as Box 8 shows, there are ways to deal with other areas as well. Indeed, in spite of the relative difficulty of working in places where people gather fuels and build their own stoves, it could be argued that donors should be concerned mainly with them, because in such areas people will not likely be developing or adapting improved stoves on their own for many years. However, it should be emphasize that treating all areas where fuel is collected as equal is not a wise policy. The type of area in which stove programmes are more likely to succeed would be regions in which people spend a considerable amount of time collecting fuel, where people have already moved down the energy ladder to straw and dung, and regions where people have already begun to show interest in improving tradigi8onal stove efficiency. Certainly the challenges and failure rates will be higher in such areas, but the potential human benefits will be greater.

The real challenge is therefore to address those many hundreds of millions of households that will not otherwise be able to change their position on the energy ladder for many decades. This would seem inevitably to involve more outside investment than just for the programmatic elements discussed above. It is important, however, to recognize the importance

of using the term "investment," and not subsidy. Donor funds should be well used in such circumstances, even though there may be few transactions in the market place. They should produce benefits at least as great as alternative approaches to the same problems (cost-effectiveness) and, where possible, show net overall benefits.

The real problem with subsidies, is perhaps not so much their magnitude, but that in so many cases they seem to sour stove projects. In almost every case, for example, programmes initially offering stoves at no cost have found that use and maintenance rates were unacceptably low. This accounts for the global survey findings that less than 10 percent of programmes now offers full subsidies. people just do not value things that are given to them. Although some programmes, for example in parts of India, have been able to reach significant numbers of poor people with nearly free stoves, there is clearly more to be learned aobut this difficult problem. Part of the problem is clearly that such groups often have other much more pressing priorities than improved stoves, priorities that might have to be addressed as part of any successful improved stove programme. Ways are needed to initiate stove programmes that benefit from some of the important lessons that have been learned, for example, the importance centralized production of critical components, and yet can reach local people who do not have significant cash resources and suffer from having to spend a significant amount of time collecting fuel. Even the most successful stove programme, that of China, which has generally relied on user purchase to date, is worried about this problem as it begins to face the task of reaching its poorer and more remote populations.

Thus, although the goal of any stove programme must be to eventually reach self-sustainability, there is a need to continue the ssearch for ways to effectively reach those areas in which such sustainability may be many decades off as well as those where it is just around the corner. In both cases, however, stove programmes are obliged to plot out a course that leads to eventual self-reliance (Jones, 1989). Indeed, as the global survey revealed, some programmes have even developed a practical definition of sustainability to be the extent to which people actually buy their second improved stove (Ramakrishna, 1991b). This action seems unlikely to be greatly influenced by factors other than the household's judgment of the stove's relative costs and benefits.

5. SUMMARY AND CONCLUSIONS

The estimate of current worldwide trade in woodfuel is of the order of 7 billion dollars, and about two million people are involved in full time employment in woodfuel production and marketing (for a discussion of the value of traditional fuel production, see Peskin and co-authors, 1991). Although in the long term, people will probably switch to cooking with modern fuels, it is clear that many hundreds of millions will be using biomass stoves for decades. It seems inevitable that an increasing amount of biomass fuel will be bought and burned in purchased stoves.

It is also clear that not all of these people can or should be reached with improved stove lprogrammes. Some are better encouraged to move up the energy ladder. Others may not be subjected to fuel shortages or high indoor smoke levels. To decide whether an improved stove programme is a good idea in a particular area, we return to the two main questions from the introduction. First, are the potential economic, social, and environmental benefits sufficient to be worth pursuing? Second, given the problems encountered in the past, is it likely that viable strategies for adoption can be implemented in this area?

In this review of the economic, social and environmental benefits, it has been found that the potential benefits of stove lprogrammes are considerable. This is so even though fuel savings are less than once thought, because of the other benefits that come as well. For example, in addition to the rather large direct benefits of fuel savings, rough estimates of the economic value of the environmental and health benefits of improved stoves typically show potential savings for each stove of about $25-100 per year. Even at modest user adoption rates, the payback period to society would be only a few months.

Given the problems encountered in many stove programmes, the second question is much more difficult to answer. The problems that some stove programmes have had in the past is that they have pursued a variety of different goals. These programmes in some case have been implemented in regions that may have little interest in the stoves. In other words, some programmes have not shown an understanding of the role of the improved stove in the energy transition. In a sense, the improved biomass stove can be considered a new stepping stone between traditional stoves and modern fuels. It occupies a special niche between the use of traditional stoves and the adoption of modern fuels by high income households. At the present time this niche is not small and the potential for adoption is large.

In answering this second question it may be good to put the stove programmes in perspective. Most of the major investiments in stove programmes have come from the individual countries without much involvement of donors. The two largest programmes in the world are in India and China, where essentially all the investments have been generated internally. The participation of donors in stoves programmes has been modest, with funding spread over a large number of programmes. Because of the fragmented nature of these efforts, there has been little ability to learn from mistakes. In fact, a review of many of the project documents indicates a tendency to reinvent the wheel. Although this is partly because of the many different institutional settings and country contexts, it also is a result of the lack of cooperation and communication among programmes.

The success of some stove programmes can provide some lessons that might be follwoed in future efforts. The programmes that have been successful have shared the following characteristics.

* The programmes have focused efforts on a group of users that would most likely benefit from and consequently adopt improved stove. This group generally, but not always, involves those that purchase biomass fuels or have difficulty in collecting their fuels. The people who first adopt improved biomass stoves are usually not the very poorest groups in society, but rather those that have limited cash income and are spending a substantial portion of it on cooking fuel.

* In the most successful stove programmes the stove itself is not heavily subsidized. This assures that the programme can be self-sustaining without extensive government support and that people are willing to pay for the benefits of the improved stove compared to the traditional stove.

* The programmes are characterized by a significant interaction between those who design the stoves, those who produce the stoves, and those who are going to use the stoves. This interaction can come in several different forms, including formal surveys, focus groups to identify problems and prospects for a particular stove design, and actual household testing of stove designs.

* Programmes that do rely on mass production of the stoves or stove parts seem

to be more successful than programmes that custom build stoves.

* External support for programmes should be limited to those factors which support the production and distribution of stoves, while subsidies to the stoves themselves should be zero or minimal. The support does not have to be large, but it must be sustained and can include support for stove design, laboratory testing, consumer surveys, information access, publicity campaigns, and perhaps credit support.

* Stoves that are not valued very highly by the consumers simply will not be purchased, therefore putting pressure on the stove producers and designers to meet the needs of consumers for efficient and useful stoves is essential.

From an institutional perspective, stove programmes have been successfully implemented by a wide range of agencies. Given the various conditions within individual countries, it is hard to generalize that one form of project or programme organization is bvetter than another. Although governments tend to be brueaucratic and cumbersome, there have been several successful programmes that have been managed by governments. By contrast, non-governmental organizations are more flexible, more committed, and closer to the users than programmes administrated by governments. However, the projects of non-governmental organizations often have suffered from short-term bursts of money and support, with little long-term direction. The lesson to be learned from these examples is that programmes can be successful implemented in a variety of institutional settings, if they are carefully chosen to reflect local conditions.

The modern improved stove can be considered as an improtant bridge for the millions of people who do not have access to low cost, readily available biomass from local woodlands and who are not yet able to afford higher cost, more expensive modern fuels. The checkered history of stoves lprogrammes is fairly predictable given the diversity of programmes, diversity of conditions under which programmes have been implemented, the limited, intermittent levels of donor support for most projects, and the wide diversity of institutions implementing programmes. In fact, many programmes are added as an after though to larger, more conventional energy or forestry projects. Given these problems, it is essestial for stove programmes to identify the groups that can benefit most from improved stoves, and to determine if it is technologically feasible to design and produce a stove that is both effiecient and meets their cooking needs. The right groups involve people with the most serious need to reduce biomass energy expenditures or time collecting biomass energy. The social, economic and environmental benefits of promoting improved stoves under the right circumstances are quite large, and the existing successes demonstrate the usefulness of well managed programmes.

6. REFERENCES

Agarwal, Bina, 1983. "Diffusion of Rural Innovations: Some Analytical Issues and the Case of Wood-Burning Stoves," *World Development,* 11(4) : 359-376.

Agarwal, Bina, 1986. *Cold Hearths and Barren Slopes,* Allied/ZED : New Delhi.

Ahuja, D.R. 1990. "Research Needs for Improving Biofuel Burning Cookstove Technologies: Encorportating Environmental Concerns," *Natural Resources Forum,* vol. 14, pp 125-134.

Alam, Manzoor, Joy Dunkerley, K.N. Gopi, William Ramsay, and E. Davis., 1985. *Fuelwood in Urban Markets: A Case Study of Hyderabad.* New Delhi : Concept Publishing Co.

Alam, Manzoor, Joy Dunkerley, and A.K. Reddy, 1985. Fuelwood Use in the Cities of the Developing World: Two Case Studies from India, Natural Resources Forum, Vol. 9, No. 3, PP. 205-213.

Anderson, Dennis and Robert Fishwick, 1985. Fuelwood Consumption and Deforestation in African Countries, World Bank Staff Working Paper No. 704, Washington, D.C.

Bajracharya, Deepak, 1983. Deforestation in the Food/Fuel Context: Historical and Political Perspectives from Nepal, Mountain Research and Development, 3(3):227-240.

Baldwin, Samuel F. 1987. Biomass Stoves Engineering Design, Development, and Dissemination, Volunteers in Technical Assistance (with Center for Energy and Environmental Studies, Princeton University): Arlington, Virginia.

Baldwin, Samuel F., Howard Geller, Gautam Dutt and H.H. Ravindranath, 1985. Improved Woodburning Cookstoves: Signs of Success, Ambio 14(4-5): 280-287.

Barnes, Douglas, 1990. Population Growth, Wood Fuels, and REsource problems in sbu-Saharan Africa, in Population Growth and Reproduction in Sub-Saharan Africa, edited by George T.F. Acsadi, Twendolyn Johnson-Acsadi, and Rodolfo A. Bulatao, A World Bank Symposium, Washington, D.C.

Barnes, Douglas and Liu Qian, 1991. Urban Interfuel Substitution, Energy Use and Equity in Developing Countries: Some Preliminary Results," paper presented at the 1991 Internation conference of the International Association for Energy Economics, East West Center, Honolulu, Hawaii, July 8-10.

Baya-Vuma, A., 1989. "Ten Years of Improved Stoves in the Sahel" Lund Center for Habitat Studies, Publication No. 27, Lund, Sweden.

Bialy, Jan, 1991a. "Evaluation Criteria for Improved Cookstove Programmes: The Assessment of Fuel Savings," Draft ESMAP Report, July 12.

Bialy, Jan, 1991b. "Improved Cookstove Programs in Sri Lanka: Perceptions of Success," Draft ESMAP Report, July 12.

Bussmann, P.J.T. 1990. "Woodstoves Theory and Applications in Developing Countries," Thesis, Technische Universiteit Eindhoven: Eindhoven, The Netherlands.

Caceres, Roberto, Jamuna Ramakrishna and Kirk R. Smith (eds) 1989. *Stoves for People,* Proceedings of the Second International Workshop on Stoves Dissemination, IT Publications: London.

Cecelski, E. 1984. "The Rural Energy Crisis, Women, Work and Family Welfare: Prespectives and Approaches to Action," International Labor Organization: Geneva.

Childers, Laurie and Stephen Karekezi, (eds.) 1989. "Guidelines for Unrban Stove Programmes," Ceylon Electricity Board and Intermediate Technology Group (UK).

Chomcharn, Aroon and R.S. Gujral, (eds.) 1991. "Report: Sub-Regional Expert Consultation,, Improved Cookstove Development Programme in South Asian Countries, " Food and Agricultural Organization: Bangkok.

Clark, Robin, (ed.) 1985. *Wood-Stove Dissemination,* IT Publications: London.

Crewe, E. 1991. "Draft Monitoring and Evaluation Guidelines for Improved Cookstove Programs," Intermediate Technology Development Group, Rugby, UK.

Digemes, Turi, "Wood for Fuel, Energy Crisis Implying Desertification: The Case of Bara, The Sudan," Major Thesis in Geography at the University of Bergen, Norway.

Eckholm, Eric, 1982. "Unicef and the Household Fuels Crisis," United Nations Children's Fund: New York.

Floor, Willem and Robert van der Plas, 1992. "CO^2 Emissions by the Residential Sector: Environmental Implication of Interfuel Substitution," Forthcoming, Industry and Energy Department Working Paper.

Foley, Gerald and Patricia Moss, 1983. *Improved Cooking Stoves in Developing Countries,* Earthscan: London.

Fraser, Alexander Haynes, 1987. "Adoption of Appropriate Technology: Smokeless Woo-Stoves in Rajasthan India," Unpublished Ph.D. thesis, University of Wisconsin-Madison.

Gill, Jas, 1987. "Improved Stoves in Developing Countries: A Critique," *Energy Policy* 15(2): 135-143.

Gorse, Jean and David Steeds, 1987. "Desertification the Sahelian and Sudanian Zones in West Africa," World Bank Technical Paper No. 61, Washinton, D.C.

Gu, Shuhua, Huang Kun, Qiu Daxiong, and Kirk Smith, 1991. "One Hundred Million Improved Cookstoves in China: How Was it Done?" Draft ESMAP Report, July 10.

Hitzhusen, Fred, 1991. "The Economics of Improved Cookstove Programs," Draft ESMAP Report, July 29.

Hosier, Richard H. and Jeffrey Dowd, 1987. "Household Fuel Choice in Zimbabwe: An Empirical Test of the Energy Ladder Hypothesis," *Resources and Energy,* 9:347-361.

Hyman, Eric L. 1987. "The Strategy of Production and Distribution of Improved Charcoal Stoves in Kenya," *World Development,* 15(3):375-386.

Jones, Donald W. 1988. "Some Simple Economics of Improved Cookstove Programs in Developing Countries," *Resources and Energy,* 10:247-264.

Jones, Mike, 1989. "Energy Efficient Stoves in East Africa: An Assessment of the Kenya Ceramic Jiko Program," Report to USAID, Report No. 89-01, Washington, D.C.

Joseph, S.K.K. Prasad, and H.B. van der Zaan, eds., 1990. "Bringing Stoves to the People: An Assessment of Impact." Nairobi: Foundation for Woodstove Dissemination and Acts Press.

Joseph, Stephen 1990. *Guidelines for Planning, Monitoring and Evaluating Cookstove Programmes,* Food and Agricultural Organization: Rome.

Joshi, Veena, Pavimal Sadaphal, and Ramchandra Pal, 1989. "Evaluation of Improved Chula Programme in Tamil Nadu, Rajasthan, and West Bengal," Report of Tata Energy Research Institute, New Delhi.

Karekezi, Stephen and Dominic Walubengo, 1989. "*Household Stoves in Kenya: The Case of the Kenya Ceramic Jiko,* Kenya Energy and Environment Organization (KENGO): Nairobi.

Kinyanjui, M. 1991. "Tanzania Charcoal Stove Project," Report to teh World Bank, Washington, D.C.

Klingshirn, Agnes, Emma Crewe and Stephen Karekezi, 1990. "Workshop Report: Monitoring and Evaluation of Stoves Programmes GTZ, ITDG and FWD," Intermediate Technology Development Group: Rugby, U.K.

Krugmann, H. 1987. "Review of Issues and Research Relating to Improved Cookstoves, "International Development Research Centre, Paper No. ODRCMR 152e. Ottawa.

Kumar, Shubh and David Hotchkiss, 1988. "Consequences of Deforestation for Women's time Allocation, Agricultural Production, and Nutrition in Hill Areas of Nepal," Research Report 69, International Food Policy Research Institute, Washington, D.C., October.

Leach, Gerald, 1988. "Interfuel Substitution" in Processings of the ESMAP Eastern and Southern Africa Household Energy Planning Seminar, held in Harare, Zimbabwe, February 1-5.

Leach, Gerald, 1986. *Household Energy in South Asia,* London: International Institute for Environment and Development, also *Biomass* Vol 12, pp. 155-184, 1987.

Manibog, Fernando R. 1984. "Improved cooking stoves in developing Countries: Problems and opportunities," Annual Review of Energy, 9:199-227,

Myers, Norman, 1980. *Conversion of Tropical Moist Forests*, The National Research Council, National Academy of Sciences, Washington, D.C.

Myers, Steven and Gerald Leach, 1989. "Biomass Fuels in Developing countries: An Overview," Lawreance Berkeley Laboratory Paper LPL-27222, Berkeley, California.

Myles, Allen Technology, 1989. "Markets and People: The Use and Misuse of Fuelsaving Stoves," A case study of a joint United Nations Environment Programme/Bellerive Foundation project Plantation and Efficient Utilisation of Fuelwood in Rural Areas of Kenya - UNEP Project No. FP/210-83-02, United Nations Environment Program: Nairobi.

Molnar, Augusta and G. Schreiber, 1989. "Women and Forestry: Operational Issues," World Bank, Washington, D.C.

Natarajan, I., 1985. *Domestic Fuel Survey with Secial Reference to Kerosene,* vols. 1 and 2, New Delhi: National Council of Applied Economic Research.

Nijaguna, B.T. and Uppin, S.B. 1989. "Wood Burning Cook Stoves," *RERIC International Energy Journal,* 11(1):35-60.

Openshaw, Keith , 1986, "Marketing of Improved Stoves," paper presented at the Kengo Regional Stoves Workshop in Nairobi, Kenya.

Openshaw, Keith, 1982. "The Development of Improved Cooking Stoves for Urban and Rural Households in Kenya," The Beijer Institute, Royal Swedish Academy of Sciences, Stockholm, Sweden.

Openshaw, Keith, 1979. "A comparison of Metal and Clay Charcoal Cooking Stoves," paper presented at the conference of Energy and Environment in East Africa. Nairobi, Kenya.

Operations Research Group, 1989. "Evaluation of National Chulha Programme in Selected Districts in Gujarat, Maharashtra, and Karnataka," report of Operations Research Group, Baroda.

Pandey, Shanta, 1991. "Criteria and Indicators for Monitoring and Evaluation of the Social and Administrative Aspects of Improved Cookstove Programs," Draft ESMAP Report, June 13.

Peskin, Henry, Willem Floor, and Douglas Barnes, 1991. "Accounting for Traditional Fuel Production: The Household Energy Sector and its Implication for the Development Process," Industry and Energy Department ESMAP Report. World Bank, Washington, D.C.

Prasad, Krishna K., Sangen, E. and Visser, P. 1985. "Wood-Burning Cookstoves," *Advances in Heat Transfer,* 17:159-316.

Prasad, Krishna, 1983. *Wood Burning Stoves: Their Technology, Economics and Deployment,* WEP 2-22/WP. 115 Geneva: International Labor Organization.

Qazi, Azra Naruddin, 1991. "A Technical Evaluation of Woodstoves in Rural Pakistan," A Cambridge Energy Research Group Paper, Cambridge, England.

Qiu Daxiong, Gu Shuhua and Huang Kun 1990. "Diffusion of Improved Firewood Stoves (China)," Institute for Techno-Economic and Energy Systems Analysis, Tsinghua University: Beijing.

Ramakrishna, Jamuna, 1991a. "The Indian National Improved Stoves Program," Draft ESMAP Report, July 10.

Ramakrishna, Jamuna, 1991b. "Reusults and Analysis of Global Survey of Improved Cookstove Programs," Draft ESMAP Report, July, 9.

Ramakrishna, Jamuan, M.B. Durgaprasa, and Kirk R. Smith, 1989. "Cooking in India: The Imapct of Improved Stoves on Indoor Air Quality," *Environment International,* vol 15, pp. 341-352.

Reddy, A.K. and B.S., Reddy, 1983. "Energy in a Stratified Society: Case Study of Firewood in Bangalore," *Economic and Political Weekly,* vol. XVII, No. 41, October 8.

Repetto, Rovert and Thomas Holmes, 1983. "The Role of Population in Resource Depletion in Developing Countries," *Population and Development Review,* vol. 9 no. 4.

Sarin, Madhu, 1990. "The Nada Chulha Programme," In Joseph and coauthors., 28-40.

Scurlock, J.M.O. and D.O. Hall, 1990. "The Contribution of Biomass to Global Energy Use," Biomass, 21(1): 75-81.

Shrestha, Ganesh Ram, Hari Gorkhali, and Kirk Smith, 1991. "The Status of Improved Cookstove Programs in Nepal," Draft ESMAP Report, July 10.

Smith, Kirk, 1987. Biofuels, Air Pollution and Health: A Global Review, New York: Plenum Press.

Smith, Kirk, 1991a. "The Health Effects of Biomass Smoke: A Brief Survey of Current Knowledge," Draft ESMAP Report.

Smith, Kirk, 1991b. "The Hearth as System Central," Draft ESMAP Report, July 10.

Smith, Kirk and Jamuna Ramakrishna, 1991. "Improved Cookstove Programs: Where Are We Now," draft ESMAP Report, July 10.

Stewart, Bill and coauthors. 1987. *Improved Wood, Waste and Charcoal Burning Stoves: A practitioners' manual,* IT Publications: London.

Tata Energy Research Institute, 1987. "Evaluation of the Performance of Cookstoves with Regard to Thermal Efficiency and Emissions from Combustion," Report of Tata Energy Research Institute, New Delhi.

Tinker, I. 1985. "Household Energy Needs in Developing Countries," Report #97, Enregy Research Group, International Development Research Center: Ottawa.

Viklund, Elisabet, (ed.) 1989. "Nordic Seminar on Domestic Energy in Developing Countries," Lund Centre for Habitat Studies, Lund University: Lund.

Walubengo, D., M. Kimani and G. NDiangui, 1988. "Kengo Regional Wood Energy Program for Africa, Nairobi, Kenya.

World Bank/UNDP, 1986. "Burkina Faso: Issues and Options in the Energy Sector," Joint World Bank/UNDP Energy Sector Assessment Program Report, Washington, D.C.

World Bank/UNDP, 1991a, "La Consommation de Bois de Feu a Niamey," Industry and Energy Department ESMAP Report, Washington, D.C.

World Bank/UNDP, 1991b, "Rwanda: Commercialization of Improved Charcaol Stoves and Carbonization Techniques," Mid-Term Progress Report, Industry and Energy Department ESMAP Report, Washington, D.C.

World Bank/UNDP, 1991c, "Zambia: Urban Household Energy Strategy," Industry and Energy Department ESMAP Report, Washington, D.C.

World Bank/University of Pennsylvania, 1991. "Energy Use in Three Poor Countries in China: Interim Findisngs of ESMAP/China Household Energy Survey," Industry and Energy Department ESMAP Report, Washington, D.C.

Wickramagamage, Piyansena, 1991. "Improved Cookstove Programms in East and Central Africa," Draft ESMAP Report, July 10.

Wood, Timothy, 1987. "Assessment of Cookstove Programs in Nepal," Report to USAID, Washington, D.C.

Zambia, Department of Energy, 1988. "The Charcoal Stove Project of Zambia," Report of the Department of Energy, Ministry of Power, Transport, and Communications, Lusaka, Zambia.

Opportunities and Policy Options for Woodfuel Using Rural Industries/Enterprises

by

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1. INTRODUCTION

In most developing countries, major development goal is promulgated to resolve the problems of people's low living standards and social equity, especially with special favor to rural people.

In order to achieve such a goal, most governments in developing countries of Asia and elsewhere, at least in past few decades, have designed and continuously implemented various economic and social development programmes with specific objectives to stimulate economic growth, improve basic infrastructures, support local governance, increase agricultural productivity, enhance employment through rural industrial activities as well as providing education, health and other services etc. The so called "integrated rural development programme" is often used as a spear header of such efforts. However due to a nature of rural development complexity and various constraints, most countries are still facing with various basic development dilemmas; i.e. low income of rural people, limited employment and job opportunities leading to high rate of urban migration, insufficient education and health services, scarcity of vital resources for family sustenance and development such as land, water, capital and technology etc.

In most Asian developing countries, agricultural population accounts for 50% or more for which its aggregated agricultural output of major crops (grain, oil, fruit, fiber, sugar, tea, coffee, coconut, rubber, meat and milk) accounts for about 2 billion metric tons annually. In forestry sector, a formal production of round timber, fuelwood and charcoal currently accounts for about 1.8 billion m3. per year (FAO/RAPA 1992). Processing of these farm and forest based products, in addition to local mineral based products requires considerable amount of energy which is naturally derived mostly from fuelwood and agri-residues, locally available.

On the other hand, the industrial contribution to employment in most Asian developing countries, still shows low figures, in the order of 5 - 20 % of total labor force (see Koopmans 1993, table 1.2).

The programmes of fuelwood/biomass energy supply and conservation, emphasizing the domestic sector have been actively implemented in most countries of the region, especially concerning with improved efficiency of cookstoves and cooking systems. Since domestic sector is one single largest consumer of fuelwood and other biomass, it is therefore quite natural to perceive this sector for a major implication for fuel saving and environmental consequence. As such, **the subject of wood/ biomass energy use in rural industries/ small enterprises have not drawn much attention from the development and energy planners, eventhough its**

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use may be equally important to the domestic sector, considering a forward integration of agricultural production and/or other local products diversification in line with sustainable rural development growth for which considerable alternate employment and income generation to agriculture could be brought about. However due to various constraints, such as the lacks of vital information for assessment and planning expertise coupled with a weakness in rural development linkages among various concerned sectors/authorities this subject has been inadequately addressed.

This brief discussion paper, therefore, aims at highlighting some of the development issues, constraints as well as the opportunity for development and promotion of the rural industries/ small enterprises in support of such integrated rural development objectives.

2. DEFINITION AND DESCRIPTION OF THE INDUSTRIES/ENTERPRISE

Under this context, what is the rural woodfuel using industries/ enterprises and its scope? By a broad definition the industry is normally perceived as a manufacturing activity operating on commercial basis while an enterprise may cover manufacturing and/or servicing activity. The rural industry/ enterprise, therefore, may be obvious. However, while recognizing that these fuelwood/ biofuel using industries and enterprises by majority locate in rural areas, there exist also similar activities operating in urban/ suburban areas such as food processing, vendining and other services. On the other hand, some prefer to use the term "traditional industries or small enterprises", there exist also exceptions of modern small enterprises that also use fuelwood such as tyre retreading, edible oil processing, etc. During the first international expert consultation on this subject held in 1986 (FAO 1987), extensive discussion was made and **the term "rural industry" was proposed to cover all industries and enterprises mentioned, inclusive of those that operate in urban/ semiurban areas, irrespective of size.** The major reason behind is to retain a focus on the rural development objective.

Due to wide ranging activities, three broad categories of wood/biomass energy based rural industries were proposed: **small-scale cottage activities, medium-scale village enterprises and large(er)-scale rural industries**. The classification matrices were based on location, ownership, labor source and organization, technology used, production regularity, form of organization and flexibility of fuel source/use. (Full information could be found in FAO 1987, FAO/RWEDP 1988, and FAO/RWEDP 1990). A summary of the classification is shown in table 2.1.

Table 2.1 Summary of main differences between the three rural industry categories FAO/RWEDP 1988)

Classification	Cottage	Village	Rural
Ownership/control of productive land	high	medium	low
Ownership/control of inputs	high	medium	low
Use of intermediaries for supply of inputs	low	medium	high
Purchase of services	low	medium	high

Studies conducted in many RWEDP participating countries, during 1985-90, however, have revealed that there exist no clear definition of what can be considered to be the cottage, village or rural industries in focus. Common industry classification criteria normally used were: number of labor employed, machinery used and/or fixed assets. The purpose of such classifications, as observed, are primarily for the authorities in issuing industrial licensing and control as well as tax collection and/or investment privileges. As such government industrial development plans and supports are usually concentrated with formal and modern industries rather the traditional, small and informal rural industries that may need more attention by the public sector.

3. TYPES OF FUELWOOD/BIOFUEL USING RURAL INDUSTRIES

Based on above definition, fuelwood/ biofuel using "rural industries" that have been identified have been grouped into following major types: **agro-processing, food processing, metal processing, mineral processing, forest products processing, textile based industries** and those that did not fall under above was placed as **miscellaneous**. Table 3.1 provides a list of activities under consideration. However it should be noted that the list given is not exhaustive as more activities could be identified and added on. Within specific activity, besides scale, there exist various diversities in energy use/mix, process technology, nature of operation, marketing as well as management. These need to be carefully considered when designing the strategies for effective intervention.

Each industry as identified in table 3.1 may fall within one or more categories as mentioned in table 2.1. For example, food processing activities can be found more often as **Cottage level activities** than other categories while agro-processing activities can be found in all three, ie. **cottage, village and rural levels**. Building material industries are often found as **village and rural levels** while pottery is normally found at **cottage level**.

Table 3.1 Type of fuelwood/biofuel using rural industries/ enterprises as identified in Asia

a) agro-processing	b) continued	e) forest products processing
- Cocoa	- Noodles	
- Coconut products	- Oil and fats	- Bamboo/cane bending
- Coffee	- Rice products	- Timber drying
- Rice parboiling	- Roasting nuts	- Turpentine distill.
- Rubber smoking	- Sweet meats	- Hand made paper
- Spice processing	- Sugar products	- Katha and Kutch
- Sugar processing	- Soybean products	- Sawmilling/impreg.
- Tea leaf drying	- beer brewing	- Charcoal making
- Tobacco products		
- Edible oil processing	**c) metal processing**	**f) textile-based**
- Slaughter house	- Black smithies	- Fabric dyeing/printing
- Fish meal	- Foundries	- Silk yarn dyeing
	- Jewelry	- Fish net tanning
		- Carpet dyeing
b) food processing	**d) mineral processing**	**g) other activities**
- Bakeries		
- Coffee roasting	- Brick making	- Road tarring
- Dairy products	- Tile making	- Soap making
- Distilleries	- Lime burning	- Tyre retreading
- Fish smoking	- Pottery	- Eating houses/food vendings
- Fish sauce	- Ceramics	
- Vegetable preserv.	- Refractories	- Laundries
- Fruit juices	- Surkhi (burnt clay)	- Hot bath service
- Fruit preservation		- Ceremonies
- Herbal medicines		- Cremations
- Meat products		

Sources: FAO/RWEDP field documents no. 3,4,7,11,12,13,17,18; Koopmans, FAO/RWEDP 1990.

4. CONTRIBUTION AND POTENTIAL OF FUELWOOD USING RURAL INDUSTRIES

Acknowledging that present data on fuelwood using rural industries in most aspects, both formal and informal subsectors, is still limited and a systematic assessment of the contribution of rural industries to rural economy and socio-economy needs to be further elaborated. However, based on national broad overviews, the importance of fuelwood/biofuel using rural industrial activities to the rural and national economies was fully recognized. Concerned experts viewed that their survival and growth were crucial to prevent rural economy stagnation or reversal to a traditional subsistence system (see also FAO/RWEDP 1988, FAO/RWEDP 1990).

These rural industrial activities strongly indicated the linkage with rural development objectives and the possibility for better attainment, especially in:

* Generation of income and off-farm employment in rural area itself (as an alternative to finding urban jobs),
* Processing of higher value added products from agriculture, forestry and mineral based productions (that directly contribute to national GDP growth),
* Prolonging storage life of perishable farm products which are far away from the market or preserving excess products for off-season demand,
* Contribution to long term sustainable forestry development through efficient production, distribution and utilization of wood/ nonwood products, including affordable fuelwood supply for local manufacturing sector.
* Establishment of essential primers for promotion of self-reliance small industries development, especially in terms of local resource and technology,
* Support to women in development, particular in cottage/home based income generation activities etc.

Examples of contribution from rural industries in some countries, based on information available, are highlighted in the box below.

Contribution of fuelwood/biofuel using rural industries on Employment, Income, GDP and Export Earning

Bangladesh Eusuf (FAO/RWEDP 1989d) gave the estimated figure of 6.8 million rural people employed in rural industries of which about 27.7% were related to major biomass energy using industries. Number of days engaged varied as 100 days or less for sugar cane gur, 101-150 days for bricks and tiles, 151-200 days for paddy processing and pottery, 201-250 days for rice products (beaten and puff rice), 251-300 days for bakeries, tobacco blacksmithy and lime and over 300 days for jewelry, soap, dairy products, etc.

India Juneja (FAO/RWEDP 1989c) reported that in 1984/85, Village and Small Industries (VSI) sector, covering traditional, modern and miscellaneous industries, employed about 31.5 million people and export earning from the VSI in same year was 54.57 billion rupees. While direct contribution of fuelwood using rural industries could not be singled out but the investigator reported that fuelwood was extensively used for process heat in many of these VSI.

Nepal Sharma (FAO/RWEDP 1992b) reported the number of industries registered nationwide in 1987 to be 9,356 out of which 6,250 or 67% was small food processing cottage industries, each employing less than 10 workers. The share of the cottage industries was 731 million Rs. or 20% of the modern industrial sector. Suwal (FAO/RWEDP 1988) identified more than 40 major groups of large and medium industries and small cottage enterprises that use fuelwood and/or residue fuels. According to his assessment fuelwood use was found to be 18 times more than officially reported.

Sri Lanka Nanayakkara (FAO/RWEDP 1986) reported that in the rural industries; namely, tea, rubber, bakeries, hotel, lime, brick, tile, pottery and related industries accounted for 560,000 formally employed workers and their annual wages accounted for 883 million Rupees in 1981.

Thailand In a recent survey on formal fuelwood using industries, the number of direct labor employment was estimated to be 100,400 persons (TFMP 1992). If applying a minimum wage rate of 70 Bahts/day and 300 working days/year, the wage earned by them would amounted to 2 billion Bahts/yr. This survey, however, did not included charcoal and wood industries and non-formal (unregistered) fuelwood using industries.

5. CURRENT CONSUMPTION AND TRENDS OF FUELWOOD AND OTHER BIOFUELS IN RURAL INDUSTRIES

To provide an idea on the magnitude of fuelwood and other biofuels (often broadly termed as "traditional energy") used in various countries and to assess the current trends as well as prospect in the demand growth/reduction, table 5.1 shows rough estimates of national consumption of conventional and traditional energy sources in selected countries. It most countries, table 5.1 generally shows lower figures of traditional energy consumption as comparing to the figures later shown in table 5.2 which are more or less updated through more recent studies. However, despite of conclusiveness in commercial energy data source provided in table 5.1, its share (of commercial energy) is generally less than 50% in most countries. If the fuelwood/biofuel data source to be more conclusive, its share in the national total would likely be increased.

Table 5.1 Apparent energy consumption estimates and share of traditional energy source in RWEDP countries (extracted from WRI 1992, table 21.2)

Country	Total energy consumption 1 / in Petajoules 1989	Share of traditional energy source, % 2/		Change of tradi. ener. source/year (from 1979-89)
		1979	1989	
Bangladesh	502	71	54	-1.7
Bhutan	30	99	95	-0.4
India	10,693	33	25	-0.8
Indonesia	2,852	53	47	-0.6
Myanmar	268	71	69	-0.2
Nepal	226	94	92	-0.2
Pakistan	1,330	26	21	-0.5
Philippines	983	38	38	0.0
Sri Lanka	153	54	52	-0.2
Thailand	1,631	41	34	-0.7
Vietnam	465	49	51	+0.2

Note: 1/ total consumption inclusive of both conventional/commercial and non conventional/traditional energy sources
2/ traditional energy source inclusive of fuelwood, charcoal, agri-residues and dung conversion factor; 1,000 metric tons fuelwood = 0.016 petajoule
1 petajoule = 10^{15} joule

Based on table 5.1, all countries, except Vietnam, experienced a slight decline in the share of traditional energy sources over the ten year period. However the rate of decline/increase appeared to be small, mostly less than one percent/year. When considering the growth rate of commercial energy demand during the same period in many countries which often recorded the double digits, this implies that the consumption quantity of traditional fuels still remains very large and the time required to tilt the major contribution from traditional to conventional in most countries would be unlikely near. Therefore, the reason to continue paying sufficient attention to fuelwood and other biofuels in these countries may be amply justified, at least in serving the rural development objectives and environmental conservation.

Table 5.2 Estimated apparent consumtpion of biofuel (1/) and its estimated share in domestic and non-domestic (2/) sectors

Country (Ref. year)	Total biofuel consumption mil.ton W.E.1/	% share in		Source
		domestic use	non-domestic use	
Bangladesh	31.93	80.7	19.3	BEPP 1987
(1986)	0.94	88.5	11.5	FAO/RWEDP 1991
Bhutan (1989)	321.83	na	na	ESMAP(est) 1990
India (1989)	89.05	na	na	Soesastro 1983
Indonesia (1979)	11.33 *	na	na	FMP (1988)
Nepal (1985)	14.0	75.7	24.3	FAO/RWEDP 1988
(1986)	28.46	na	na	ESMAP 1991 draft
Myanmar (1990)	36.00	72.5	27.5	FAO/RWEDP 1989
Pakistan (1984)	60.82 **	78.1	21.9	Ouerghi 1992
(1991)	35.18	80.0	20.0	ESMAP 1992 draft
Philippines (1989)	8.8	85.2	14.8	FAO/RWEDP 1986
Sri Lanka (1983)	13.08	82.2	17.8	CEB 1990
(1990)	30.37	66.3	33.7	NEA 1988
Thailand (1988)	26.20	75.0	25.0 ***	TFMP(draft) 1992
(1991)	46.80	87.0	13.0	FAO/RWEDP 1992
Vietnam (1989)				

Note: 1/ biofuel inclusive of fuelwood, charcoal and other biomass residues
2/ non-domestic use inclusive of industry, agriculture, commercial service, etc.
* accounted only for household use
** accounted only for fuelwood and charcoal
*** fuelwood and charcoal calculated based on formal rural industries use only.

From table 5.2, it is interesting to note that in all the countries, biofuel share in nondomestic sector, the majority of which are woodfuels, is relatively small only in the order of 10-30%. Therefore in near future, the trend in biofuel consumption would still be highly influenced by the domestic sector consumption, rather the industrial one.

6. PROSPECTS FOR RURAL INDUSTRIES GROWTH RELATED TO ECONOMY, ENERGY AND WOOD ENERGY

It is a well established global norm that household energy users would shift away from more drudgery to use solid fuels (eg. dung, agri-residues, fuelwood) to more convenience forms of fuel (eg. refined solid, liquid, gas and electricity) as the income rise and such refined energy source become available, even having to pay a higher price. For the industrial sector, in contrast, the shift would very much depend on energy economy and supply security in comparison with these locally available solid fuels.

On the contrary, the shift from fuelwood and other biofuels in rural industrial applications may not share the same pattern as in domestic sector. The maintenance of fuelwood/biofuel

option in rural industries would primarily depend on its economic price and local supply security in competition with other commercial energy sources. As long as the biofuel system can continue to provide a better industrial productivity, it may be difficult to see the rural industries voluntary shift to other energy sources. Further, adopting of new energy system, especially fossil-based energy, would require extra capital for new equipment and/or technology. While vital information on most rural industries, especially on how they operate/ survive is still limited, it may be difficult to predict the actual industries' growth and their biofuel demand growth. However as the governments are trying to promote more industrialization in rural areas, more biofuel demand growth may be a probable presumption. Even that should be the case, the demand increase for fuelwood and other biofuels would be gradual and that local biofuel suppliers would presumably be able to respond to the monetized market demand.

Regarding the supply of fuelwood and other woody biofuels, as more and more of environmental friendly green resource systems are fast emerging, especially through improved tree production strategies, (eg. participatory forestry, agroforestry, farm/private forestry, industrial forestry, agricultural plantation industries, etc.), the opportunities to promote efficient use of fuelwood and other woody bio-residues in rural industries may appear to be bright. Which rural industries, however, should deserve priority attention in development, this would require an appropriate careful assessment for which the development criteria should be also established. For example, in one expert consultation (FAO 1987), it proposed that such criteria may included fuelwood consumption and intensity, labor, employment and income development, food production and security, nutrition and health and impact on the environment.

7. OPPORTUNITIES FOR PROMOTING ENERGY CONSERVATION TECHNOLOGY AND PRACTICE

From country studies related to fuelwood use in rural industries, two common problems emerged; a) the industries were facing with fuelwood scarcity which was indicated by high price and/or its non-availability when needed, leading to adoption of more residue-fuels, b) energy conversion efficiencies, in most cases and at all operational levels (cottage, village and rural), were generally low and highly variable, i.e., requiring large quantity of fuel per unit product output. Table 7.1 below demonstrates wide variations in specific energy consumption (SEC) both within and between products as well as scale of operations. While acknowledging that in some cases, the data presented still do not conform with the SEC standard, nevertheless, in most cases, the variations do suggest weakness in heat energy conversion efficiency as well as the quality of product output. Other problems related to energy conversion that were often mentioned were health hazards to workers due to heat and smoke exposure, in particular when substituting fuelwood with dusty and/or inferior residue fuels.

Despite of such problems identified and apparently good opportunities exist for fuelwood/ biofuel conservation measures, very limited improvements and public intervention so far have been made. Among important reasons: a) in most rural industries, more than often, entrepreneurs are overwhelmed with many day to day business problems (eg. production, inputs, marketing, working capital etc.), making improvement of energy system by the enterprise themselves secondary ; b) field based R & D focussing on improvement of energy conversion systems relevant for such applications have been very limited due to lacks of researcher interest and/or inadequate public support. In cases where improved systems have been found through field pilots, an arrangement to transfer of such improved technologies, especially through extension and training of industrial workers and entrepreneurs, often does not exist.

Table 7.1 Specific fuelwood/biofuel consumption(SEC) in some rural industries

Industry Type Activities	SEC Value Fuel Consumed/Unit Product	Source
a) Cottage activities		
- Roasted gari (cassava)	3.0 - 4.0 kg wood/kg. gari	FAO 1987
- Rice parboiling	0.3 - 0.4 kg husk/kg rice	(BGD) FAO/RWEDP 89d
- Bread	0.6 - 2.2 kg wood/kg flour	(NEP) FAO/RWEDP 92
- Palm oil	7.0 - 9.0 kg wood/4.5 liters	FAO 1987
- Smoked fish	0.2 - 16.0 kg wood/kg prod.	FAO 1987
	1.4 kg coconut fronds/kg prod.	(IND) DNES/IIT 90
- Cane gur	1.9 kg bagasse/kg gur	(BGD) FAO/RWEDP 89d
- Date palm gur	3.0 kg palm residues/kg prod.	(BGD) FAO/RWEDP 89d
- Beer	0.4 - 1.0 kg wood/liter	FAO 1987
- Potteries	0.4 - 1.0 kg wood/kg prod.	FAO 1987
- Silk cocoon processing	14 - 34 kg wood/kg silk yarn	(BGD 89, PAK 89) *
Village enterprises		
- Bricks	0.3 - 1.5 kg wood/brick	FAO 1987
	0.1 - 0.4 kg wood/kg brick	(NEP) FAO/RWEDP 92b
- Ceramics	1.0 - 2.0 kg wood/kg pot.	FAO 1987
	0.6 - 0.8 kg wood/kg pot.	(NEP) FAO/RWEDP 92b
- Tiles	0.2 - 0.5 kg wood/tile	FAO 1987
- Lime	2.0 - 3.0 kg wood/kg lime	FAO 1987
- Breweries	0.2 kg wood/liter	FAO 1987
- Soap	0.4 - 0.6 kg wood/kg soap	(BGD 89, IND 89) *
Rural industries		
- Bricks	0.3 - 1.5 kg wood/brick	FAO 1987
	0.08 - 0.1 kg coal/kg brick	(NEP) FAO/RWEDP 92 b
- Tiles	0.2 - 0.5 kg wood/tile	FAO 1987
- Lime	0.6 kg wood/kg	FAO 1987
- Rubber smoking	0.8 - 2.0 kg wood/kg prod.	FAO 1987
	0.3 - 0.6 kg wood/kg RSS	(MAL) FAO/RWEDP 90
- Copra	0.5 - 1.5 kg wood + coco resid/kg	FAO 1987
- Tobacco	5.0 - 12 kg wood/kg cured leaf	FAO 1987
	3.1 - 7.5 kg wood/kg cured leaf	(PHI) FAO/RWEDP 89a
- Tea	1.5 - 2.0 kg wood/kg cured leaf	FAO 1987
- Coffee	0.75 - 2.0 kg wood/kg roasted bean	FAO 1987

Note * FAO/RWEDP 1989d and FAO/RWEDP 1989c, respectively.

Table 7.2 Estimated energy and labour requirements of some rural industries

Type of industry	Share of biomass energy and labour as % of the production cost		Country reference
	Energy	Labour	
Rice parboiling	3.0	13.0	BGD (est)
Tea	5.0	-	NEP
	5.0-12.0	-	SRL
Tobacco	9.6	26.0	BGD
	19.2	-	PHI
	5.2	-	THA
	48.0	-	PAK
Bakeries	4.8	6.7	BGD
	7.6	14.2	IND
	9.3-10.7	10.2-13	NEP (1992)
	3.4	34.2	PHI
Bricks	57.0	21.0	BGD (est)
	37.0	43.0	THA
	77.3 *	22.7 *	NEP (1992)
Lime	11.7	11.0	BGD
	63.5	12.9	THA
	73.0	-	PAK
Clay tiles	14.8	21.0	THA
Soap	5.2	6.3	BGD
	2.8	8.0	IND
Timber drying	60.0	12.5	PHI
Rubber	2.8	2.1	THA

Source: Koopmans FAO/RWEDP 1990, FAO/RWEDP 1992b

* Only two major costs considered; exclusive of capital, depreciation, land rent and management costs.

Criteria for energy conservation development.

In trying to support a wider industrial development objective, there exist good opportunities (besides tree/fuelwood production support that is being addressed in the other paper) for **energy conservation intervention to meet a single and/or multiple rural industries objectives;** such as saving fuelwood/biofuel, enhancing industrial productivity, improving product,s quality and uniformity, reducing environmental pollution, improving ergonomics of workers, etc. However, careful analysis of the industry status and performance under consideration must be made to decide where the major problems lie. Table 7.2 provides, as examples, of relative importance between two criteria, energy and labor. More criteria as mentioned, of course, should be added to complete an analysis. From table 7.2, it may be very

reasonable to focus the intervention, for example, on energy saving in; tobacco curing (Pakistan), lime (Pakistan and Thailand) and timber drying (Philippines). While for the brick industry, an intervention for saving both energy and labor may be more appropriate (Bangladesh, Thailand and Nepal). For the industries like bakeries, it is unlikely that fuelwood saving alone would offer a sufficient incentive to bakers. However since the raw material inputs (flour, yeast, sugar) are high and labor cost is moderately high, improvements in product output quality (leading to better price) and labor productivity are still possible through improved baking oven and related systems. In rubber smoking industry where the share of fuelwood and labor combined (Thailand) appear to be less than 5 %, an intervention to save fuel and labor would make little sense to the entrepreneurs. However, as smoking time require is long (one week) and the inventory cost of rubber sheet per load per smoking section (ca. 35 metric tons) is over half a million Bahts(USD 20,000), energy system intervention that could significantly reduce smoking time would be most welcome. Further ensuring of fuelwood supply would be highly receptive to the rubber smoking industry. In traditional pottery industry in Nepal(FAO/RWEDP 1992b), a new circular wood-fired kiln that was reported to be popularly adopted was due to a very low rejection rate of finished products, in addition to 30 % fuelwood saving, as compared to the traditional firing method. In Thailand, a shift from ricehusk-fired to wood fired kiln in stove making industry in Ratchaburi, in fact, has increased the fuel cost to some extent but the saving in firing cycle(from over 3 days in ricehusk-fired kiln to just 10- 12 hrs with wood-fired kiln) has increased labor productivity significantly, in addition to a reduction of previous firing rejects from 10-15 % to just 2-3 %. Above examples highlight the need for careful assessment of real user's needs to justify an energy intervention. In many cases, energy intervention alone may prove to be not at all a pragmatic proposition.

It has been recognized that a whole industry data covering critical aspects in details, especially economic and socio-economic performances, process technologies, energy systems, market systems, labor working conditions (of women and men), local resource supply systems, etc. need to be collected to enable a proper diagnosis and design of energy and/or other interventions for the industries. Table 7.3 below, as an example, attempts to illustrate the relative importance of intervention objectives in various group of rural industries based on available (written and non-written) information. As can be seen in the table that an (energy) intervention leading to improved products quality and uniformity has too often become the case than just energy saving alone. The combination of intervention objectives in most industries, would greatly enhance the acceptance of improved energy systems.

Table 7.3 Relative Importance of Intervention Objectives for Various Rural Industries

Intervention Objective(s)	Energy Saving	Labour product.	Products' Quality/ Uniformi.	Raw mat. Reduct./ Improvmt.	Others
Mineral based					
- Bricks	***	***	**	*	?
- Lime	***	**	**	*	?
- Tiles	**	**	***	*	?
- Potteries	**	**	***	*	?
- Ceramics	**	*	***	*	?
Agroprocessing					
- Copra & coco-products	**	*	***	?	?
- Tea	*	*	***	?	** taste
- Coffee	*	*	***	?	** taste
- Tobacco	**	**	***	?	** taste
- Rubber	*	*	***	***	*** wood supp.
- Rice parboiling	*	*	***	?	?
- Sugar	**	**	***	?	?
- Spices	*	*	***	***	*** taste
- Oil and fats	*	* **	***	*	?
- Silk	?	***	***	*	** women cond.
Food processing					
- Bakeries	*	**	***	***	*** taste
- Noodles	*	**	***	*	?
- Dairy products	?	*	***	?	?
- Distilleries	*				
- Fish smoking	***	*	***	?	?
- Herbal medicine	?	*	*** +	?	** smoke contam.
- Soybean, tofu	*	*	***	?	?
- Meat products	?	*	***	**	*** taste
Forest products					
- Katha and kutch	**	*	**	?	** taste
- Hand made paper	*	**	**	**	?
- Resin distill.	**	*	***	*	?
- Timber drying	***	*	***	**	?
Metal working					
- Blacksmith	?	*	*	?	** cc. quality
- Foundries	*	*	***	**	** cc. quality
Other activities					

Note: Relative weighing scale are; *** high, ** medium, * lower, ? not sure or not yet known.
+ = more, - = less

8. POLICIES INHIBITING THE SUSTAINABLE USE OF WOOD/BIOFUELS IN RURAL INDUSTRIES

From the foregoing presentation, we may presume that, perhaps, improvements of economy and socioeconomy in rural areas are highly desirable by the countries of the region. And the promotion of rural based small industries/enterprises through mobilizing agricultural, forestry, mineral and manpower resources available (or to be developed) locally is an important option for rural development programme. Then what should be done from the national development perspectives, especially the formulation of sectoral policies, plans and programmes? And how should they be carried out? A diagram shown below reflects, an example, an hierarchical development framework. It is important to note that at the action or project level, a streamlining of intersecorial inputs and coordination would be essential to avoid overlaps and effective delivery.

At present, if assessing current development mainstream in the concerned sectors, one may find that sectoral policies, plans or programmes supporting rural industries are vague, if not absent, especially in the **major productive sectors; industry, energy, forestry and agriculture.**

Policies (and/or a lack of policy) and development directions that can be considered as hindrances to fuelwood/biofuels based rural industrial development, for four the four sectors that may be raised for discussion are:

Industry

a) Policy focussing mainly on modern, large scale, and/or heavy industries leaving small, rural based industries largely unattended,

b) Industrialization advocacy on imported high technology/ equipment, leaving local development/ improvements of technologies appropriate for rural use as a secondary,

c) Lack of programmes and support addressing to small rural industries' needs, in line with rural development objectives, (often due to lacks of small industries data and planning skills),

d) Upper tier of industries that normally registered with concerned authorities, usually enjoy most of public development supports,

e) Industry policy instruments are used mostly for setting and applying regulation and control, while actual small industry development support package not addressed,

f) Fuelwood/forest products use in rural industries often not encouraged by industrial sector to avoid possible conflicts with forest/natural resources conservation authorities.

WOOD ENERGY FOR RURAL INDUSTRIES DEVELOPMENT HIERARCHY

OTHER OBJEC-TIVES/ GOALS	**NATIONAL POLICY** NATIONAL DEVELOPMENT OBJECTIVES/GOALS (Social & Economic) (e.g. Social Equity, Income Distb, Increase Econ Prod, Rural People, Upliftment, etc.)
OTHER POLICY MATTERS	**SECTORAL POLICIES, STRATEGIES & PLANS** ENERGY: - Right energy mix; - Indigineous Rescs.; - Renewable,environ. frieldly resources; - Energy for poor rural sector; - Energy to support rural industry FORESTRY: - Forest/tree products for sustenance, trade and industries; - Wood for dom. & ind. fuel; - For./tree for sust. farming and environment INDUSTRY: - Commodity security for nation & export; - Employment alter.to agriculture; - Value added of farm, forestry miner. resources; - Small rural ind. AGRICULTURE: - Food security; - Produces for rural industry; - Residues for fuel; - Tree in farms; - Off-farm activities; - Etc.
SECTORAL PROGRAMMES NOT RELATED R. INDUS.'S SUPPORT	**PROGRAMME LEVEL** ENERGY: - Rural energy database, - Rural energy prod. support, - Enercon in dom. & ind. - Environ. benign & trade ener.sources FORESTRY: - Database at district, - Tree prod. programmes, - wood products - wood fuel use, control support INDUSTRY: - Small ind. database, - Mineral res. datab, - S. industry support prog., - Pollution - etc. & etc. AGRICULTURE: - Agri. datab, - Crop diversitity - Crops for industrial processing - Agroforestry, - Efficient use of agri-residues
OTHER INDUS-TRIES MODERN & TRADITIONAL	**INTERSEC. COOP. & COOR. AT PROJECT LEVEL** FUELWOOD/BIOFUEL USING RURAL INDUSTRIES DEVELOPMENT (for rural & national econ & socio econ. development)

Energy

a) Myths and fears on deforestation complex and a general lack of appreciation on (old) fuels like fuelwood leading to nonpolicy and/or a purposeful omission,

b) Policy advocation for stimulating supply and use of fossil energy (often under influence of commercial energy suppliers and business/ urban users), thus weakening the position of wood/biomass energy resources that could otherwise be more actively produced by farmers and rural people,

c) Renewable energy illusions, especially from long time horizon (minor) renewable energy sources (eg. wind, solar, etc) over present major sources like fuelwood and other biofuels,

d) Policy and programme implement limitations due to a lack of relevant database on fuelwood/biofuel production, distribution/trade and utilization systems,

e) Energy policy addressing recent global environmental concerns and implications on the over use of fossil fuels not yet fully established to enable serious exploration of alternative carbon neutral bioenergy resources.

f) Objectives of energy development often stated as energy production thus oblivating the actual purpose of energy servicing to the national economic and socio economic development efforts.

Forestry

a) Inability of forestry sector to cope with deforestation (and forest land encroachment) led to many country bans for direct use of logs, fuelwood and other products from natural forest, at least for commercial purpose,

b) Forest protection policy leading to barring access and opportunities of local people to co-manage natural forest lands and resources for multi-purpose,

c) Strict legal control of forest products and woodfuels harvesting, transport and utilization, irrespective the source of origins and resource owners,

d) Lack of formal recognition that within a country the bulk of fuelwood also comes from private farms and homesteads, thus special facilitation to encourage more production and use of this group of tree resource needs to be provided to farmers,

e) Policy discouraging public not to use forest products/ woodfuels but advocating to more expensive commercial energy substitutes,

Agriculture

a) Present agricultural policy not favorable to forest/ tree products development as alternative to cash crops, (eg. agro- and farm forestry),

b) Lack of (auxiliary) agro-industries policy to resolve the over supply/ shortage situations and widely fluctuating price of farm produce creates uncertainties for agro-industries' development due to insecurity of raw materials supplies,

c) Policy instruments to promote and implement crop diversification and production control of major crops often weak and ineffective,

d) Lack of long term policy guidelines on sustainable farming, compatible with new environmental norm.

Above policy constraints raised in each sector, as a single or in combinations may have resulted in a low status of rural industries and of fuelwood/biofuel dependent industrial production. Its development potential, therfore, may largely depend on how these sectoral policies can be adapted and /or reviewed in line with rural development objectives while well maintaining of the natural resource conservation.

9. CONCLUSIONS

In Asia and other developing regions, solid biomass fuels in the form of firewood, charcoal and other bio-residues have been used widely in domestic and traditional industries and enterprises, so called here as "rural industries", for perhaps centuries. The significance of woodfuel using rural industries, based on economic and socioeconomic contributions, especially in rural areas, appears to be high and generally found second only to agricultural activity. It is perhaps fair, if one wants, to call this group of industries as **"backbone industries"** of the region since they support thousands or millions of jobs in rural setting as well as producing goods and services to the countries, in particular in the processing of food, agricultural, forestry and mineral based products as well as numerous small enterprises (inclusive also of urban areas).

The quantity of woodfuels and other biofuels consumed for this group of industry and enterprise, in most countries was found to be small (10-25 %) comparing with the domestic sector. However, despite of a small consumption share, their contribution to national economic development is considerable, in terms of rural income generation, employment alternative to farming as well as the value added products from local based resources mentioned.

Realizing that in a medium term, when the household economy generally improves, energy shift to better and more convenience forms of fuels for domestic cooking would materialize. The shift in rural industrial fuels, on the other hand, would depends largely on fuelwood and/or other biofuel supply security and its price competitive with other fuel sources commercially available.

While more and more of environmental friendly renewable green energy resources, deriving from various sustainable tree production systems such as community forestry, agroforestry, farm/private forestry, industrial forestry and agri-plantation crops, are fast

emerging, the opportunity to promote efficient use of wood/ biofuels in rural industries, at least, in a medium term appears to be good since this sector can support fuelwood/ biofuel commoditization better than the domestic sector.

Based on limited information available, many possibilities for energy intervention in rural industries exist. However the design for an intervention would have to depend on well founded criteria adequately supported by field information to enable a proper industries' diagnosis. Unfortunately, most such data are sadly lacking, especially related to how these industries operate, their economic and socioeconomic performances, process and energy technologies, labor working condition, environmental impacts (positive and negative) etc.

Potential for rural economy development spearheading by rural industries, for which many of them are wood/biofuel dependent, has been marginally recognized, in many countries. This situation has given rise to weak development supports from concerned public sectors and hence retarding the potential growth due to the industries (mostly small) inability to secure necessary development inputs; e.g. capital, technology, entrepreneurial skills, marketing etc.

It is considered that national and sectoral policy and programme supports and development directions, especially from industry, energy, forestry and agriculture sectors, for example, may be needed to achieve an overall rural development goal for which rural industries can continue to play an important and expanding role. However, it appears that, at the project level, an intersectoral approach would be highly desirable to coordinate the public delivery system to the industries. Due to vast scope of the subject, it is unlikely that one single sector could be able to handle effectively.

10. REFERENCE

BEPP 1987. Bangladesh Energy Planning Project, Final Report, Vol. I-VII. Prepared by Sir Halcrow and Partners, Motor Columbus Consulting Engineering Inc., Petronus Consultants SA in association with TSL and PSL. ADB-UNDP for the Planning Commission, Government of Bangladesh.

CEB 1990. Sri Lanka Energy Balance and Energy Data 1990, Alternative Energy Development Branch, Ceylon Electricity Board, Colombo, Sri Lanka.

DNES 1990. Design and development of a small scale Tuna fish processing system for Lakshadweep by Rajpal P.S. and R. C. Maheswari CRD&AT/IIT. Dept. of Nonconventional Energy Sources Publication: Antika Vol.3 p. 135. Dec. 1990.

ESMAP/WB 1985. Thailand: Issues and Options in the Energy Sector. A joint NEA/ESMAP study.

ESMAP/WB 1991a. Myanmar: Energy Sector Investment and Policy Review Study.

ESMAP/WB 1991b. Background Report on the Biomass Sector in Myanmar (draft).

ESMAP/WB 1990. India: Wood Fuel Supply Situation Unpublished Draft Report.

ESMAP/WB 1990. India: Wood Fuel Supply Situation. Unpublished Draft Report.

ESMAP/WB 1992. The Philippines Household Energy Strategy Study (Draft). A joint study OEA/ESMAP.

FAO/RWEDP Wood energy for rural industries in Thailand: Field Document No. 3, Bangkok, 1986a. March 1986.

FAO/RWEDP 1986b. Wood energy systems for rural and other industries in Sri Lanka: Field Document No. 4, Bangkok, August1986.

FAO 1987. Technical and Economic Aspects of Using Woodfuel in Rural Industries. A synthesis of national studies and results of the 1st expert consultation on wood based energy systems in rural industries and village applications, Rome Dec.1986. Prepared by Rabbe Thun.

FAO/RWEDP 1988. Wood based energy systems in rural industries and village applications in Nepal: Field Document No. 11, Bangkok, December 1988.

FAO/RWEDP 1989a. Wood based energy systems in rural industries and village applications in the Philippines: Field Document No. 12, Bangkok, Mar. 1989.

FAO/RWEDP 1989b. Wood based energy systems in rural industries and village applications in Pakistan: Field Document No. 13, Bangkok, May 1989.

FAO/RWEDP 1989c. Wood based energy systems in rural industries and village applications in India: Field Document No. 18, Bangkok, July 1989.

FAO/RWEDP 1989d. Wood based energy systems in rural industries and village applications in Bangladesh. Field Document No. 17, Bangkok, 1989.

FAO/RWEDP 1990. Status of Wood Energy in Rural Industries in Asia. Regional Expert Consultation on "Wood Based Energy Systems in Rural Industries and Village Applications" Hat Yai, Thailand, 12-16 March 1990.

FAO/RWEDP 1991. Wood Energy Sectoral Analysis; Master Plan for Forestry Development in Bhutan. FAO-RWEDP, Field Document No.32, December 1991.

FAO/RWEDP 19924. Fuelwood and Energy Sectoral Review; Tropical Forestry Action Programme Vietnam. FAO-RWEDP, Field Document No. 33, May 1992.

FAO/RWEDP 1992b. Wood/Biomass Based Energy Systems in Rural Industries and Village Applications, Nepal: Working Paper of the National Seminar.

FAO/RAPA 1992. Selected Indicators of Food and Agriculture Development in Asia-Pacific Region, 1981-1991. FAO Regional Office for Asia and the Pacific, Bangkok, 1991 RAPA Publication No. 1992/15.

Koopmans, A. 1993. Wood Energy Development in Asia: Asssessment of Critical Issues, Constraints and Prospects. Draft paper for this RWEDP expert consultation on data assessment and analysis for wood energy planning.

NEA 1988. Thailand Energy Situation. National Energy Administration, Bangkok.

Ouerghi, A. 1992. Fuel Use in the Residential Sector and Its Impact on the Environment. Paper Presented at the 3rd International Energy Conservation Symposium, Islamabad 25-26, April 1992.

Soesastro, Energi dan Pemerataan. Centre for Strategic and International Studies, Jakarta. H.et.al.1983. Tingsabadh, C. 1991. Rural Energy Issues in Thailand and the Role of Wood Energy. Discussion Paper Prepared for the Exchange Visit of National Coordinating Members between Participating Countries - RWEDP, Bangkok, July 1991.

TFMP 1992. Fuelwood consumption survey in fuelwood using industries formal sector, Thailand. Summary of survey results of Thai Forestry Master Plan Project, Royal Forestry Department, Bangkok.

WRI 1992. World Resources 1992-1993. A Guide to the Global Environment. Oxford University Press, New York, 1992.

Opportunities and Policies Initiatives for Wood Fueled Industrial Heat and Power Systems

by

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1. INTRODUCTION

Wood industries produce large quantities of residues that can be used for energy. Technologies for energy conversion have been successfully utilized all around the world. This paper intends to briefly present these different technologies in relation with their application in the wood industries. Some case studies are also presented. The role of the governments is then analyzed in connection with the economic and environmental impact of using biomass as a fuel.

2. STEAM PRODUCTION AND COGENERATION

Depending on the needs of the factory, a steam producing plant will produce only heat, only power or both heat and power. Combined production of heat and power constitutes cogeneration. The principle of steam production remains almost the same in all cases. Differences will come from the next step, i.e. the way steam will be used.

The most conventional objective of using steam is heating: steam is directly sent to heat exchangers being part of the process (dryers, hot presses, ...). If only power or both heat and power are needed, steam can be sent to a turbine. These alternatives are illustrated in figure 1.

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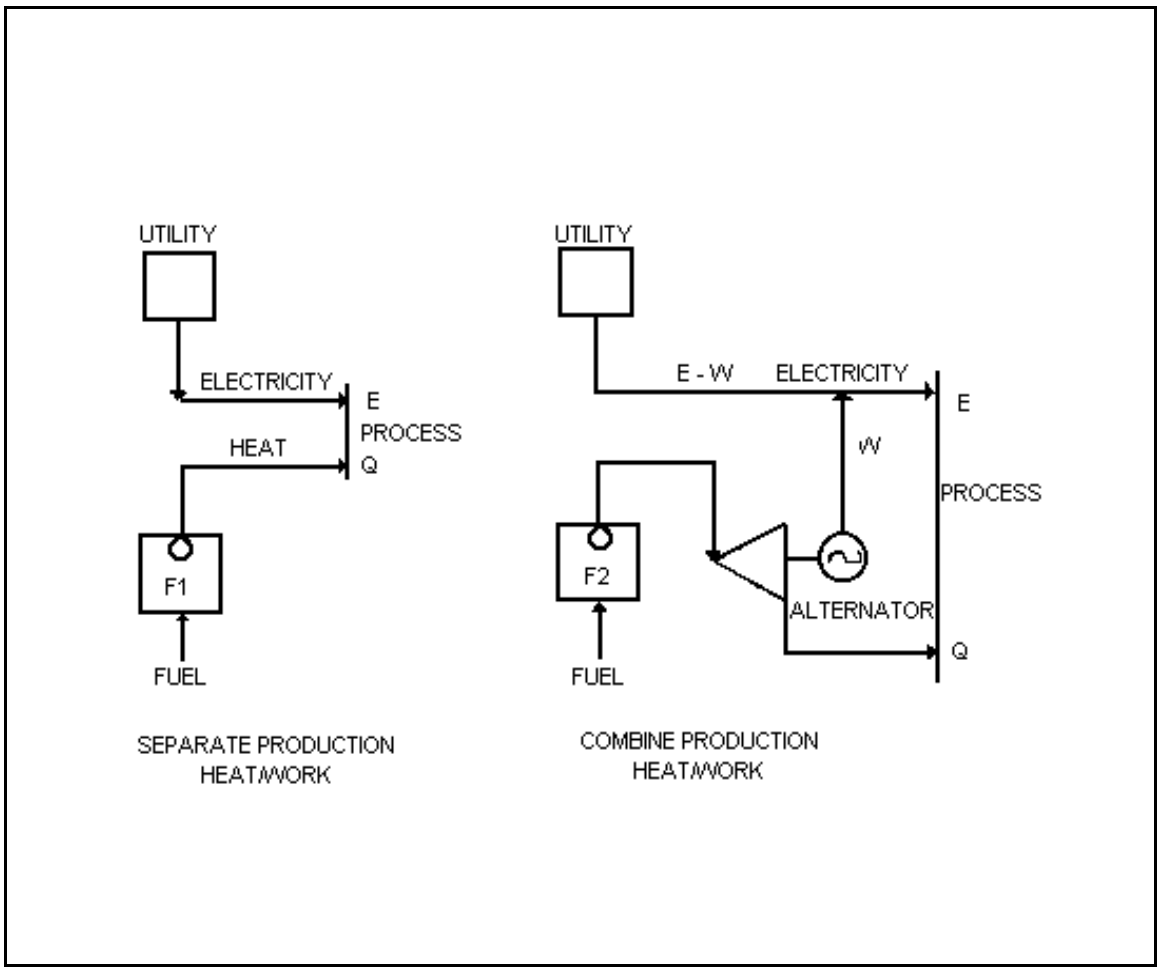

Figure 1: Separate and Combined Production of Heat and Power (Mohanty, 1992)

There are two main types of steam turbines: condensing and back pressure. The use of one or another model will mostly depend on the heat-to-power demand ratio of the factory.

Condensing turbines are preferentially used when:

- only power is required;
- there is an excess of process steam;
- two separate boilers for heat and for power are used because of an excess of residues.

Non condensing or back pressure turbines are more appropriate when:

- there is a need for both process heat and power;
- there is a problem of wastes disposal and where a low energy conversion efficiency of the fuel is an advantage.

Entering the turbine at rather high pressure, the steam will leave it at a lower pressure, sometimes negative in the case of condensing turbines. If intermediate pressure steam is needed, an extraction turbine can be used. All these possibilities are described in figure 2.

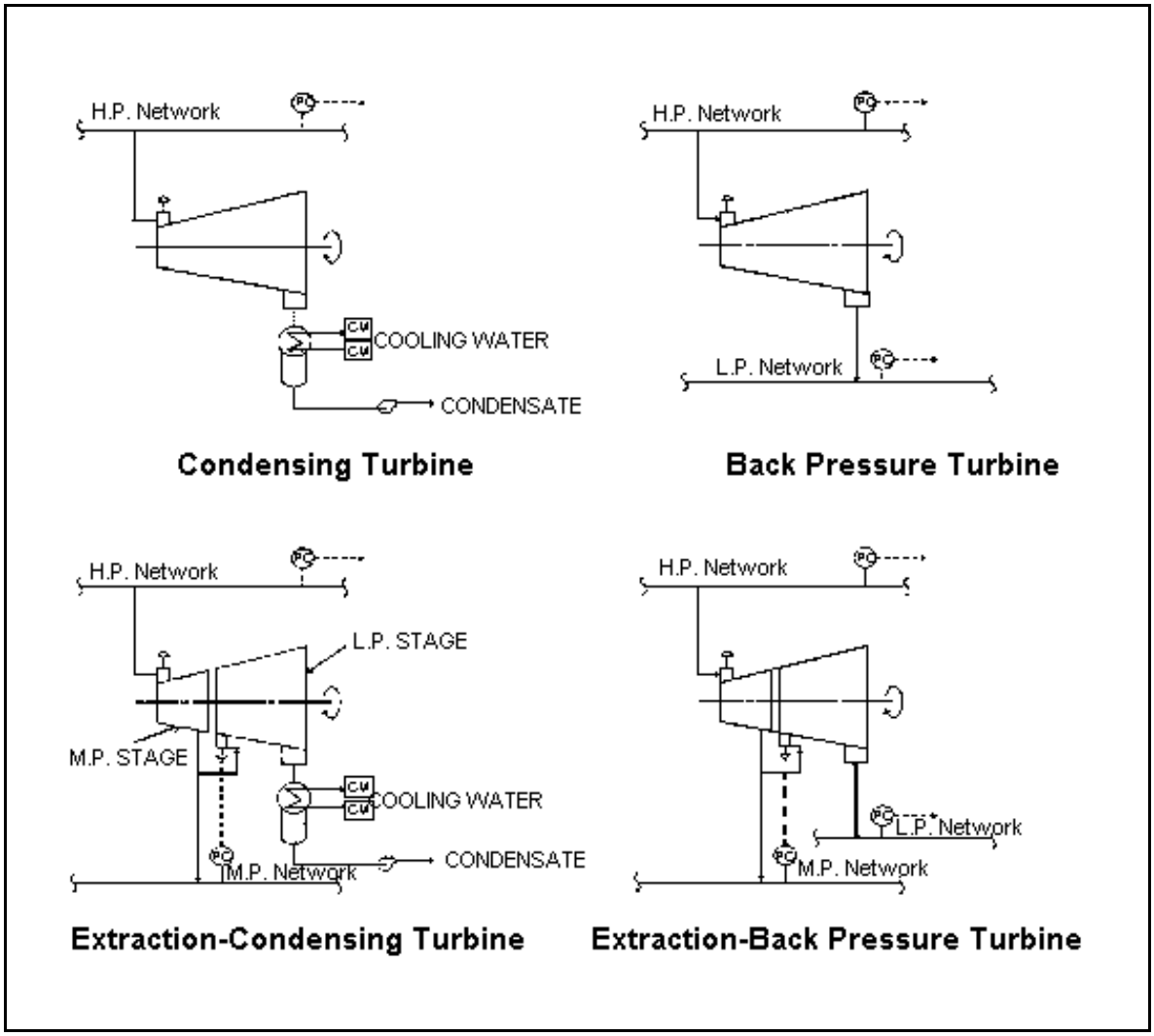

Figure 2: Different Models of Steam Turbines (Source: Mohanty, 1992)

At an energy point of vue, cogeneration is much more attractive than only power generation. The global efficiency of cogenerating systems can reach 85% and even more versus about 30 to 35% in case of electricity production only. This is illustrated in figure 3.

3. ENERGY REQUIREMENTS IN WOOD INDUSTRIES

The following examples constitute a non exhaustive list of applications in the wood industries.

3.1 Heat for Kiln Drying

Heat is provided to the kiln dryer through steam directly coming from the wood waste boiler. It is a simple and cheap system to convert wood residues into useful energy. It is commonly used all around the world.

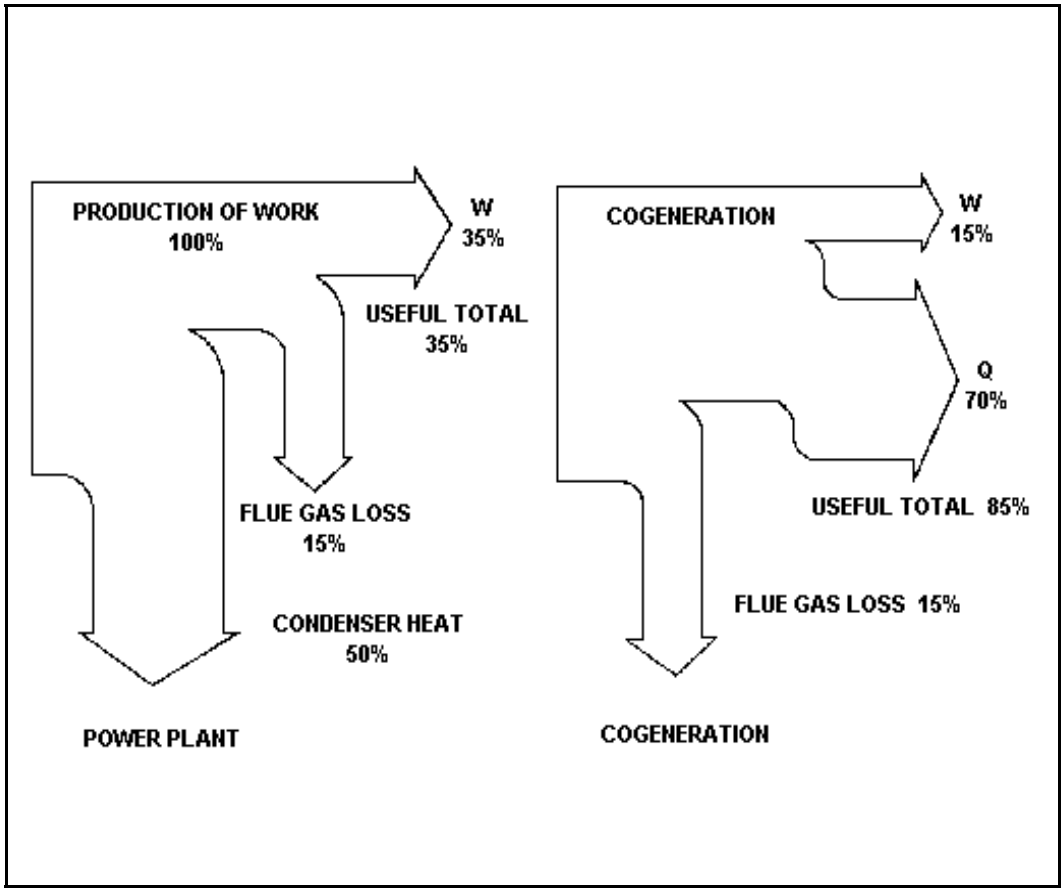

Figure 3: Energy Conversion in Conventional and Cogeneration Plants (Mohanty, 1992)

3.2 Heat for Particle Board Hot Presses

Principle is the same as 3.1, except that sometimes, hot oil is used for heat transfer. Study case Nº 1 presents this application.

3.3 Heat for Plywood and Veneer Plants

Almost all plywood and veneer factories burn their dry wood wastes to produce steam for drying all hot pressing. Most of them use diesel gensets to cover their electricity needs. Only the biggest ones use cogeneration systems. These case will be developed later.

3.4 Power from Condensing Turbine

Steam enters the turbine at high pressure. The exhaust steam which is at low or negative pressure proceeds toward a condenser. No steam is sent to the process. The energy of the steam is fully utilized for power generation. That is what happens in sawmills without drying facilities. Such a power plant is illustrated in figure 4.

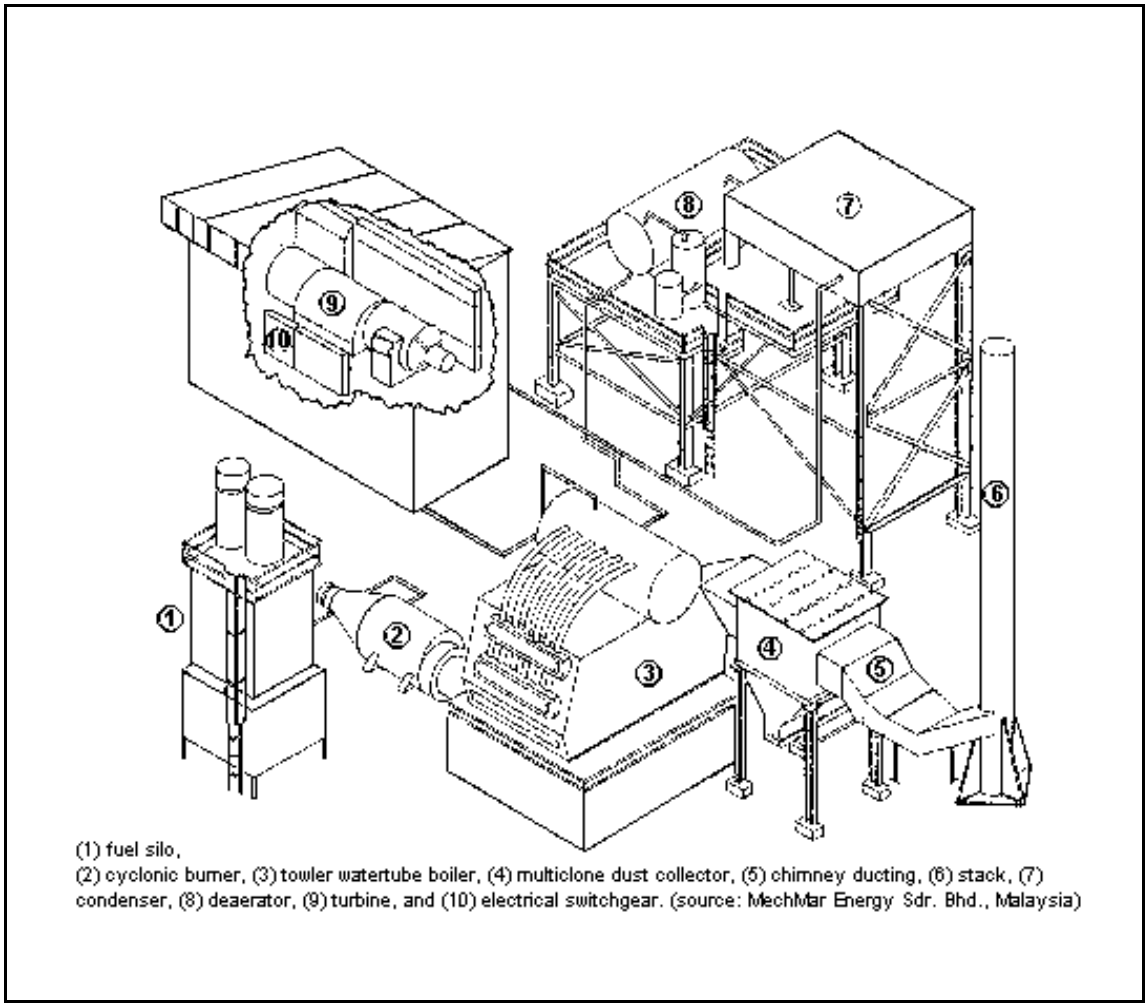

Figure 4: Schematic Diagram of a Mini Power Station with Condensing Turbine (Winrock, 1991)

3.5 Cogeneration with a Condensing Turbine

Before entering the steam turbine, a part of the steam is diverted to the process and, if necessary, passes through a pressure reducer. This technology is mostly applied:

- in sawmills equipped with kiln dryers;
- in plywood factories for veneer drying and hot pressing.

This application is illustrated in figure 5 and in case study Nº 2.

3.6 Cogeneration with Back Pressure Turbines

Back pressure turbines are the most appropriate when there is an important need for low pressure steam. While electricity is generated by the expansion of the steam in the turbine, low pressure steam for the process is recovered at the exhaust of the turbine. This is particularly adapted to integrated wood complexes. Figure 6 shows this principle.

3.7 Combination of Condensing and Back Pressure Turbines

Back pressure and condensing can be coupled either in series or in parallel. In series, the excess process steam produced by the back pressure turbine is sent to a condensing turbine. In parallel, steam coming from the boiler is divided into two streams for the two turbines. This is illustrated in case study Nº 3.

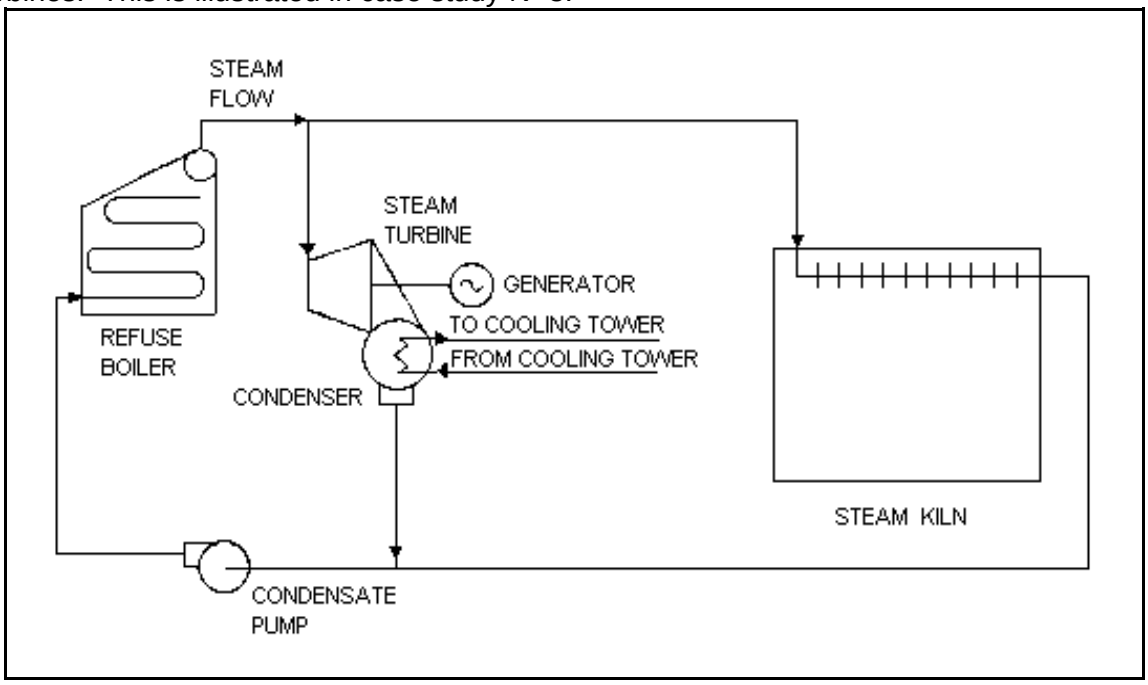

Figure 5: Cogeneration in a Sawmill with Condensing Turbine Cycle (Winrock, 1991)

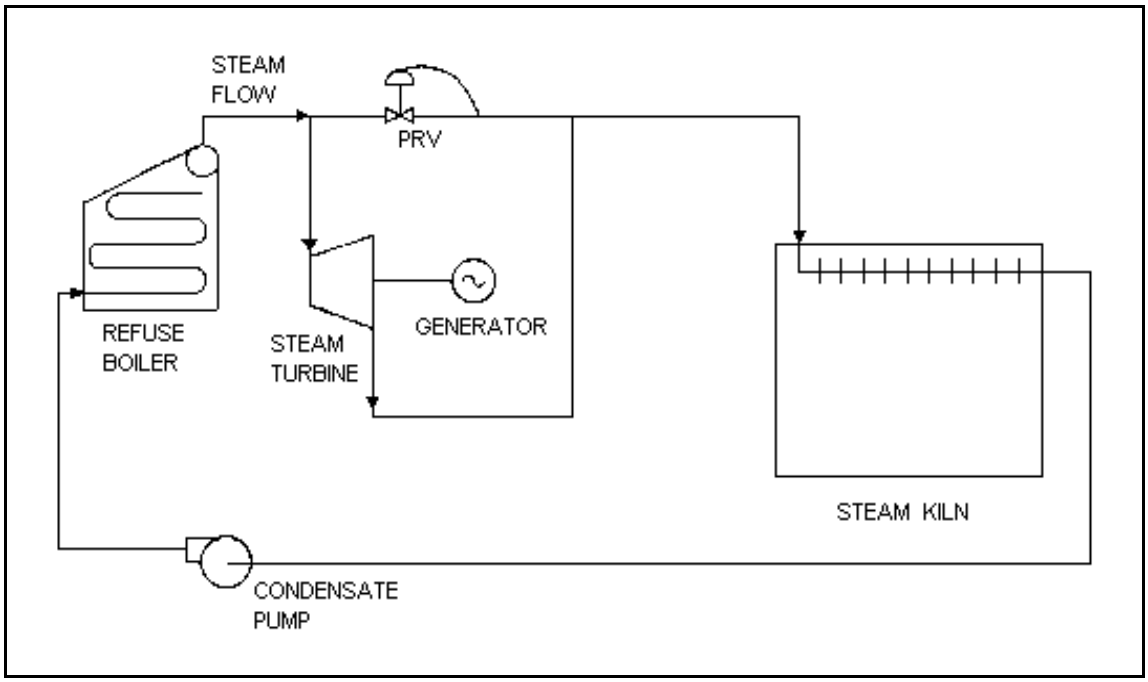

Figure 6: Cogeneration in a Sawmill with Non Condensing Turbine (Winrock 1991)

4. INSTITUTIONAL FRAMEWORK AND POLICIES

So far, it may not be said that governments have really encouraged the use of wood residues for energy, except maybe in some western countries.

The use of wood residues for electricity production and particularly for cogeneration should be promoted through incentives of any kind by all governments for two main reasons: the fuel oil savings it gives rise to and its positive impact on the environment.

4.1 Fuel Oil Savings

It looks that the world has only realized how important it was to conserve energy in the seventies when the first oil crisis rose. As a consequence, energy conservation programmes have been launched everywhere. The main objective was to decrease as significantly as possible the oil consumption.

These oil savings represent foreign currencies savings for importing countries and a potential of supplementary incomes in foreign currencies for exporting countries.

At the wood industry level, even if the investment cost is higher than for oil fired equipment, the economic analyses show attractive internal rate of return and short pay-back periods compared to oil solutions.

4.2 Environmental Impact

Using biomass for energy instead of fuel oil has a direct influence on pollution. Wood being a virtually sulfur-free fuel, the SO_x rejection to the air is very low, negligible compared to fuel oil combustion emissions. NO_x content in the combustion fumes are also much lower.

In most cases, burning oil for energy in wood industries means that wood residues must be incinerated or dumped. These traditional practices are also important sources of pollution. The wood residues are generally wet and additional oil is sometimes requested for their incineration! Dumping them into rivers or landfilling also constitute sources of river or groundwater pollution.

Efficient combustion in well regulated and controlled energy plants minimizes the emission of pollutants. In addition, modern plants are generally equipped with depolluting devices in case unacceptable levels of particulates leave the combustion chamber.

Regarding the global warming effect, it is well-known that burning biomass is producing much less greenhouse gasses than fossil fuels.

Moreover, at the carbon cycle level, burning biomass does not increase the CO_2 content in the atmosphere.

5. CONCLUSIONS AND RECOMMENDATIONS

There are still huge potentialities of utilizing wood residues for energy. Technologies have been working for years and there is no longer doubt about their reliability. But so far, wood residues have only been extensively used for heat production, rather rarely for power generation. Enormous quantities are still incinerated everywhere in the world without any energy recovery.

Wood industrialists are often reluctant to invest in biomass energy plants because of higher investment costs and a lack of confidence in the technologies reliability because of a lack of awareness. National energy centers have a very important role to play in advising them.

More national or international programmes should be set up in order to inform them about the existing installations and helping them to carry out their feasibility studies. More demonstration projects should be implemented. Governments should also be convinced that it is the interest of their countries to limit their fossil fuels consumption for obvious economic reasons and environment protection.

6. BIBLIOGRAPHY

Mohanty, B., 1992. Power and Heat Generation from Biomass. AIT, Bangkok, Thailand, 27 p.

Winrock Inc. 1991. Industrial Energy and Electric Power from Wood Residues. BEST for USAID, 51 p.

Case Study 1: Particle Board Factory in Thailand

Capacity	:	200 m^3 board/day
Hot press energy requirements	:	7,620 MJ/h
Annual operating period	:	7,980 hours
Biomass availability	:	24 t/day (sander dust and sawdust)
Biomass LCV	:	158 MJ/kg

Before: Fuel oil boiler

Fuel oil consumption	:	1,530 t/year
Fuel oil cost	:	320,000 USD/year
Cost/GJ	:	5 USD/year

Now: Biomass super heated water boiler

Capacity	:	8,400 MJ/h
Investment (including boiler + auxiliaries, civil work, ...)	:	300,000 USD
Annual operation/ Maintenance Costs	:	40,000 USD
Cost per GJ	:	14 USD
IRR	:	62%
PBP	:	7 months

Case Study 2: Wood Complex in Malaysia

Activities	:	sawmilling, plywood, laminated boards, blackboards
KD Heat requirements	:	7 t steam/hour
Power requirements	:	1,500 kW max.
Annual running period	:	6,000 hours
Biomass availability	:	3,400 t/month (off cuts)
Biomass LCV	:	105 MJ/kg

Before: Diesel gensets

Diesel cost	:	450,000 USD/year

Now: Biomass boiler + condensing turbine

Steam boiler	:	30 t steam at 22 bar (saturated)
- Fuel consumption	:	8 t off cuts/house
- Heat production capacity	:	11 t/hour
Condensing turbine	:	1,650 kW (inlet: 21 bar; outlet: 0.25 bar)
Investment cost (including boiler, turbine, civil work, ...)	:	2,100,000 USD
Operation/Maintenance Costs	:	157,440 USD
IRR	:	74%
PBP	:	1,4 year

Case Study 3: Wood Working Industry in Malaysia

Activities	:	sawmilling, kiln drying, moulding
Production capacity	:	3,000 t/month
KD heat requirements	:	up to 2,200 MJ/h for drying 1,000 tons
Power requirements	:	1,000 - 1,500 kW
Annual running period	:	4,800 (KD: ----> 8,000)
Biomass availability	:	2,430 t/month (sawdust, off cuts)
Biomass LCV	:	11,7 MJ/kg

Before: Diesel oil fired boiler

Diesel consumption	:	7,560 t/year
Diesel cost	:	1,580,000 USD/year

Now: Biomass boiler + 2 turbines

Steam boiler	:	16 t steam/hour at 22 bar (superheated)
Boiler consumption	:	5 tons biomass/hour
Heat production capacity	:	9,200 MJ/h (4 tons steam/hour)
Power capacity	:	1,500 kW
Back pressure turbine	:	600 kW (inlet: 22 bar; outlet: 6 bar)
Condensing turbine	:	200 kW (inlet: 22 bar; outlet: 0.25 bar)
Investment	:	1,410,000 USD
Annual Operation/ Maintenance Costs	:	88,000 USD
IRR	:	53%
PBP	:	2,2 years

A Policy Framework for Biomass Energy Analysis and Commercialization

by

Matthew S. Mendis[1]

1. INTRODUCTION

Recognition of the Problem

1.1 In March of 1990 at the Regional Expert Consultation in Hat Yai, Songkla, Thailand, the following was noted in relation to the biomass resources in the developing countries represented:

> Wood and to a lesser extent other biomass by all standards is a good source of energy and it has been used from time immemorial and its use, no doubt, will continue in the future. Large quantities of biomass are consumed in rural industries, but in general with (both) low efficiencies and technical levels and there is considerable scope for improvement...In addition product quality and profitability can be enhanced.[2]

1.2 Unfortunately, the same situation can be said to persist in 1993. In most of the attending participants' countries, even though biomass energy accounts for a major portion of total energy consumption, and despite enormous available resources, there remains a general lack of sustained and coherent efforts to commercialize the biomass resource base and enhance regional and/or national development and profitability. The fact is that in most of the countries of interest what is being wasted is not only prospectively large and indigenous resources for commercial energy supply, but opportunities for environmental resource management, financial profitability and long-term development.

1.3 Non-Commercialization of Biomass. The key question that continues to confront this Expert Consultation three year later is why the biomass resource base found in the developing countries is not being more effectively harnessed and utilized for commercial energy purposes. Indeed, if but a fraction of the time and financial resources spent on oil and gas development in these countries -- which often times yields negative results -- were dedicated to developing the available biomass resources, the results would undoubtedly show a better understanding of supply and demand patterns and a significant contribution to commercial

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[1] Alternative Energy Development, Inc. (AED), U.S.A.

[2] Ake Koopmans. "Wood Based Energy Systems in Rural Industries and Village Applications: Synthesis of Regional Data", in Status of Wood Energy in Rural Industries in Asia. Food and Agriculture Organization of the United Nations, April 1990., p. 39.

energy from biomass. Instead, most efforts to seriously address the issue of biomass commercialization remain, at best, uncoordinated and piecemeal. In addition, analyses or research efforts often emphasize individual components of biomass development when what is required is a composite, analytical approach or policy framework that promotes viable resource development and commercialization.

1.4 Need for Coherent and Integrated Policy Framework. In fact, this paper contends that what is lacking in the effort to improve biomass commercialization is precisely a coherent and composite policy framework that allows effective analysis, efficient development and commercialization of biomass energy programs and projects in developing countries. The piecemeal approach that characterizes biomass development today has, unquestionable, lead to advances in certain specific areas, e.g. fractional attempts at resource quantification, detailed technical analyses, etc. However, this fragmented approach to analysis has also meant that related and vital areas are overlooked and/or neglected, often resulting in program and/or project failure. In turn, two general attitudes emerge: i) a general disinterest with the sub-sector; or ii) a perception by government and private sector entities that it is an area too difficult to organize for investment, despite its vital importance and expanded potential.

1.5 Despite the noted importance of biomass, the fact is that in 1993 the thrust of domestic and international financial resources and technical expertise dedicated to the energy sector of developing countries will remain firmly focused on oil, gas, electricity and coal. Yet this paper proposes that, in part, it is the analytical, policy framework used for commercial energy analysis and investment that can also be effective in the commercialization of biomass resources. That is, this paper proposes that biomass energy development, in order to have significant commercial impact, must be diligently addressed in a broad policy framework that insists upon and encompasses integrated analyses in the following areas: (i) supply analysis; (ii) technical evaluation; (iii) financial/economic analysis; as well as (iv) institutional analysis -- that latter of which defines, among other issues, mechanisms that allow national and international entities, including the private sector, to participate in and promote sustained follow-up and investment.

1.6 Specifically, and to borrow from the established analytical framework for oil and gas development, the composite upstream and downstream parameters of biomass development, including exploration, transmission, production and marketing must be more effectively analyzed. Most important, the analyses must be carried out an integrated manner that is conducive to and mobilizes project investment. To continue the analogy to the oil and gas industry development, it would be difficult to imagine a host government in a developing country and its participating international and national partners -- including private sector entities -- committing major investments to oil and gas development if all phases of the composite development and commercialization process were not adequately addressed, i.e. the composite upstream and downstream parameters necessary for viable project development and commercialization.

1.7 Emphasis on Institutional Analysis. The critical areas noted above, i.e. supply, technical, financial/economic and institutional analyses, as well as the need for

an integrated approach to program and project development, are, therefore, the subjects of this discussion paper. In particular, emphasis is placed on the topic of the institutional analysis, including the sustained commitment necessary from participating entities for viable commercial biomass development. In fact, a key contention here is that it is the institutional component that is perhaps the most often overlooked in the effort to develop both programs and projects.

1.8 Oil and Gas Development Comparisons. To demonstrate the need for integrated analyses that lead to commercialization, the paper will draw specific comparisons to the oil and gas industry development process. This presentation concludes by noting three individual cases that highlight and advocate the need for a sustained and integrated approach to commercial biomass development. That is, weaknesses in the "integrated chain of development" -- to use a term often applied to oil and gas industry development -- will continue to result in program and project failure unless the development process is an integrated one.

1.9 Inclusion of Wood with Other Biomass. Prior to discussing the outlined policy framework for development, it is crucial to clarify a key issue. As noted in the proceedings from the March 1990 Conference, although the title of this paper specifies wood energy development, in the context of this Conference and the respective countries of interest it is fitting to discuss and analyze wood and residues from agricultural waste together, i.e. biomass. This position is evident and most appropriate given the tremendous quantities of both wood and agricultural residues generated in the countries of interest and the prospectively expanded commercial energy applications. One statistic from the March 1990 Hat Yai Consultation Conference conveys this point:

> ...the amount of residues used as energy source in India alone amount to about 66. 8 million tons which (in energy terms) is equal to the total consumption of energy of Thailand and Pakistan combined or is sufficient to cover 4.5 times the total energy consumption of Bangladesh.[3]

1.10 In addition, the 1992 Evaluation Mission for the Regional Wood Energy Development Project (RWEDP) succinctly recognized the experience and need of incorporating biomass residues as part of the rural energy supply base as well as the importance of this more incorporating view in overall woodfuel supply and demand strategies.[4] This paper supports this position and stresses the urgent need for an integrated analytical approach to biomass resource development if program or project commercialization is to be effective.

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[3] Koopmans, op. cit, p. 7.

[4] Food and Agricultural Organization of the United Nations, "Final Report Project Evaluation Mission", March 1992, for the Regional Wood Energy Development Programme in Asia.

2. SUPPLY ANALYSIS

Difficulty of Quantifying Biomass Resources

2.1 While the contribution of biomass to the total energy supply in developing countries is readily apparent, and has been cited and discussed at length in these Conferences and subsequent proceedings, quantification of the resources available in developing countries is difficult. To paraphrase from the World Bank's 1987 handbook on household and rural energy in developing countries: information remains relatively scarce, interpretations on the data vary widely, and few non-specialists are familiar with the basic approaches to this form of energy development.[5] This position has lead to a situation where, despite the current importance and potentially enhanced role of biomass in commercial energy, data are often times inadequate for investment and commercial development. The Office of Technology Assessment of the United States Congress recently summarized the scenario accordingly:

> Biomass fuels are an important source of energy in developing countries, supplying over three-fourths of the total energy consumed in almost all of the lower income developing countries. The contribution of biomass fuels to total energy supplies in the entire developing world is unclear. Biomass fuel consumption is difficult to measure, as much of it never enters a commercial market..(however)..biomass fuels supply about 19 percent of total energy according to the International Energy Agency. Other researchers, however, estimate this number at 33 to 35 percent.[6]

2.2 Lack of Reliable Data. At the outset or any commercialization effort it is precisely this lack of data that impedes an understanding of and a more sustained, methodological and integrated approach to the commercial development of biomass resources. The situation is most frustrating for while critical data are weak or missing, extensive data on the commercial energy sector of developing countries are widely available and quoted. A case in point: the above-cited technical report for the United States Congress, in the chapter "Energy Supplies in the Developing World", devotes 16 pages to commercial fuels, i.e. oil, gas, coal and electricity (generated from nuclear, hydro, geothermal and solar) in developing countries and yet only 3 pages to biomass fuels.

2.3 This dearth of supply data, whether national, regional or site-specific is, in part, a problem of perceived financial benefit as well as a problem of priority and analytical focus. This problem has been created by the countries themselves, the bilateral and multilateral agencies and private sector national and international entities. First, a great deal of time, effort and financial resources have been focused on commercial fuels, i.e. oil, gas, coal, electricity, precisely

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[5] Gerald Leach and Marcia Gowen, "Household Energy Handbook", World Bank Technical Paper No. 67, 1987, p. iv.

[6] U.S. Congress, Office of Technology Assessment, Energy in Developing Countries, OTA-E-486 (Washington, DC: US Government Printing Office, January 1991), p. 100.

because of the projected and resulting financial benefits. Indeed, good project analyses for the commercial fuel sector are generally transparent in assessing the financial and economic benefits resulting from project investment, i.e. Net Present Values (NPV), Benefits/Costs, Internal Rates of Return (IRR), contracts establishing sharing of benefits, etc. Thus, with a clear view of prospective financial viability, data for the sector, unlike the biomass sub-sector, are usually well developed and organized.

2.4 No Standard Analytical Approach for Supply Data. Inadequate data and commercial development in the biomass sub-sector are also due, in part, to the fact that a standard analytical framework is absent. That is for the conventional energy sector a system has been established where it is systematic and generally straightforward to assess prospective development of and lending for oil, gas, electricity and/or coal. In fact, there is usually a set methodological approach that is followed in terms of project assessment, development and lending -- including detailed analysis on supply quantification. For example, the following is cited from a World Bank manual on oil and natural gas development:

> The development and commercialization of an oil field is a fairly well established practice, and the steps to be taken by the operator are clearly defined in the contract made between the oil company and the state. In the case of an oil discovery, the commercial evaluation... can be made reasonably quickly once the main physical characteristics of the field have been assessed. Once commerciality has been established and there is agreement between the operator and the host country, the project moves to its development phase.[7]

2.5 In the case of oil and gas development the assessment of available supply is systematic and a critical component in the overall upstream assessment process. In turn, the same supply analysis is also a key component of the integrated upstream/downstream assessment process. Prospective supply for oil and/or gas commercialization is even quantified in terms proven and probable reserves. For biomass fuels, however, even in the case where the resource supply is readily apparent, e.g. the residues from large milling operations., the "steps to be taken by the operator" are far from being clearly defined. In turn, supply quantities, prospective energy values or financial profitability remain largely unknown and, in all too many cases, commercial energy opportunities are lost.

2.6 No Focal Point. In part too, the problem of supply data is one of priority and focus on the part of governments. In many countries the approach to quantification of biomass supplies in diffused throughout agencies inside or outside the energy sector or even non-governmental agencies and development groups. In many countries, inter-agency coordination groups -- or the basic establishment of -- are the first requirements in attempting to quantify available biomass resources for commercial energy applications. More common, most efforts at quantifying biomass supply data are often uncoordinated within governments, disjointed, or carried out with no established national guidelines. The results are not only loss of valuable data, but often times costly repetition.

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[7] World Bank, Managing Gas Industry Development, Energy Department Paper No. 29 (Washington, DC: August 1985) p. vii.

2.7 In fact, in most developing countries even though biomass energy accounts for a significant portion of energy consumption, there is no department or division of wood in the energy ministries -- let alone biomass -- handling supply data in a systematic and organized manner. In the best of cases, biomass fuels are sometimes included in divisions handling "renewable" or "non-conventional" energy. As stated, the primary reason for this is financial. Again, the biomass sector is not seen as a revenue generating/earning sector for national accounts, unlike oil, gas, coal or power, i.e. the commercial fuel sector. This lack of perceived revenue earning capacity results in diminished government interest, often complemented by a lack of significant and sustained interest on the part of bilateral and multilateral agencies, as well as the private sector. The overall result is a lack of organized supply data on the available resources, as well as weak management of or significant investment in the sub-sector as a whole.

2.8 Need to Change the Perceptions on Importance of Biomass Energy. One of the first challenges therefore in addressing the sub-sector, and the first step in developing coherent and organized data on supply, is to change the government and private sector perception of the value of biomass energy in these developing countries, as well as the associated perspectives of bilateral and multilateral agencies. This task, while not easy, is not impossible in that it is already well know that the biomass sub-sector is crucial to the social being and environmental stability -- with the latter component now taking on a especially renewed interest.

2.9 Unfortunately, however, all the relevant facts and figures will not accomplish the desired goal. For example, it has been well known and cited for years that biomass constitutes a significant portion of total energy supply and consumption in developing countries. Yet despite this fact, the thrust of financial and analytical resources remain firmly focused on the commercial energy sector. The recent World Bank study "Capital Expenditures for Electric Power in the Developing Countries in the 1990's" demonstrates the overriding emphasis on the commercial fuel sector:

> The scale of future investment demands for the energy sector in developing countries is projected to be very large. The World Bank, for example, estimates that investments of $125 billion annually (twice the current level) would be needed in developing countries to provide adequate supplies of electricity. According to World Bank estimates of annual average expenditures on commercial energy supply facilities for developing countries, electricity accounts probably for one-half of the total; oil, including refineries, accounts for about 40 percent; and natural gas and coal 5 percent each. These expenditures do not include investment in small-scale renewables or energy conservation.[8]

This figure ($125 billion) represents virtually the entire annual increase in the combined GNP of the developing countries.[9]

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[8] U.S. Congress, Office of Technology Assessment, op. cit., p. 34. from World Bank, "Capital Expenditure for Electric Power in the Developing Countries in the 1990s", World Bank Industry and Energy Department Working Paper. Energy Series Paper No 21, Washington, DC, February 1990.

[9] U.S. Congress, Office of Technology Assessment, op. cit., p. 13.

2.10 Need for Examples. While statistics and figures are necessary in changing perceptions, alone they will not induce action. For this there must be both a clear perception and a demonstration of financial benefit. The best way for this to occur is through examples where biomass commercialization is: i) analyzed in a coherent, methodological upstream/downstream framework where the financial benefits are apparent; and, following this, ii) successfully implemented and in a sustainable manner. For the government's part, this can be initiated through institutional/legislative efforts, project support, and/or direct project development. In any of these cases, sustained government support will undoubtedly be critical -- including the option of leveraging the support of bilateral and multilateral agencies. In addition, in most of the developing countries, government will have to the lead in defining the role of and incentives for private sector participation. Two brief examples of legislative and financial initiatives leading to private sector involvement in the commercialization of biomass are illustrative:

Costa Rica. In Costa Rica, new and transparent legislation and financial commitment on the part of the government to purchase private power from small-scale producers for sales to the national grid resulted in the private entrepreneurial development of a renewable energy system. By way of example, this led to a proliferation of requests for permits from prospective owners of small-scale renewable energy systems, including hydro and biomass projects. Legislation has now moved towards larger-scale systems (up to 15 MW) with project development and financial mechanisms already in the works;

United States. In the United States, PURPA legislation in the 1970's defined legal parameters and prospective financial support for private-sector development of power systems for electricity sales to existing grids, including the development of commercial biomass systems. With the successful implementation of numerous projects, there is now in excess of 18,000 MW of electricity being supplied by private generators in the U.S., including numerous biomass energy systems.

2.11 Need to Centralize and Standardize Data Development. The critical point is that even prior to demonstrating biomass commercialization, the first step for most developing countries is the sustained development of adequate and reliable data and data bases systems. Ideally, there should at least be centralized/standardized national data, supported by more region-specific data on the various biomass resources available, e.g. wood waste, sugar waste, rice husks, etc. From this, site-specific data on the particular types of biomass supplies available and complementary energy equivalents can and should be developed as part of any project development. By all accounts, however, it will be the government that has a defined role in the organization of this data, if not in its actual development,
then in coordination and setting national guidelines and priorities for government agencies, non-governmental groups, as well as bilateral and multilateral financial institutions. Hence, the commitment to and organization of data are the first steps in the overall policy framework necessary for commercialization of biomass resources.

2.12 Given the development, proliferation and relatively low cost of very powerful computers, it is interesting to contemplate the Management Information Systems (MIS) that could be developed if but a fraction of the $125 billion cited by the World Bank for the commercial energy sector was dedicated to developing adequate and reliable national data bases on biomass resources and their prospective energy applications. In terms of linkages, such MIS development could also be designed to complement environmental resource management throughout developing countries.

2.13 Link Environmental Resource Management with the Biomass Resource Base. Indeed, given the focus on environment and the strong pressure now being exerted for sustainable development, it is apparent that linking environmental resource management with both quantification of the biomass resource base and prospective energy applications could be the spark that ignites a clearer and more comprehensive approach to quantification of available biomass resources. In fact, governments should insist that such a linkage occurs. This environmental/ resource data approach, along with the necessary component analyses, i.e. technical, financial and institutional, could improve the prospects for enhanced investment in biomass commercialization. It will, however, have to be the commitment of policy makers to see that these links are established.

2.14 As advocated at the outset of this paper, supply data, whether national, regional or site-specific, is but the first step in the project development cycle for biomass commercialization. In advocating a general policy instrument for biomass development and commercialization the critical point remains: an integrated approach to project development is essential. Again, the starting point of this integrated process should be: i) standardized data on available and "probable" resource supplies, i.e. supplies that could be harnessed in the future: ii) energy equivalent potentials; and iii) linking analyses to the environmental sustainability of the resource base. Holding to the analogy for oil and gas development, this approach represents the upstream analysis for prospective investment in biomass energy systems. Complementing this, coordination and commitment are required on the part of governments, bilateral and multilateral agencies, as well as the private sector in working to ensure that such data is coherent, organized and capable of being built upon.

3. TECHNICAL ANALYSIS

Role of Technical Analysis

3.1 The technical analysis is the second component of the advocated balanced, integrated and comprehensive evaluation framework. It is in this phase of the analyses where, among other disciplines, experienced civil, mechanical and or electrical engineering expertise is usually required. The following succinctly summarizes the role of the technical component of what should be an integrated development framework:

> Once a set of projections has been agreed upon for both demand and supply, alternative development schemes can be designed. At this stage only conceptual engineering will be required to assess the comparative technical and economic feasibility of alternative schemes under various demand assumptions. The analysis should also include a comparison of alternative technologies and approaches to...development and infrastructure...as well as a comparison of the various codes of practice used in the industry world-wide (maximum operating pressure, safety regulation, unit measurement, demand risk), which would affect the design and therefore the cost of the facilities to be built. It might be important at this stage for the host country to secure the assistance of an organization with operating experience in order to avoid "wrong" technical decisions, which might prove costly in the future.[10]

3.2 Technical Analysis of Biomass Projects Tends to Dominate the Process. The statement comes from the cited World Bank manual on oil and gas industry development in developing countries and the evaluation process that, for these sub-sectors, is assumed to be a requisite for project development and commercialization. By way of analogy, the statement and approach are clearly applicable, however, in outlining the integration of the technical analysis of biomass commercialization into the integrated project evaluation process. More often, however, it is in the technical analysis phase that biomass project assessments become overly focused. That is, the engineering analysis is often carried out as an individual, separate component significantly divorced from the other critical upstream and downstream realities encountered. The reasons for this are straightforward: the engineering analysis is probably the one area for which there is the most solid and reliable data.

3.3 For biomass development, the technical analyses is perhaps the most direct and straightforward phase in the assessment process. Yet it is also because of this straightforward dimension, e.g. a defined engineering analysis, that it tends to receive the most diligent attention and focus. It is usually the component where numerous technical options can be clearly defined. The problem here is that the technical analysis, while having to be detailed and exacting, in fact dominates the thrust of most program and project analyses dealing with biomass commercialization, while the other critical components, i.e. supply, financial, institutional parameters, are overshadowed and underemphasized.

3.4 A broad example illustrates this point: a recent draft report -- with government, bilateral and multilateral financial support -- on prospective biomass utilization and commercialization in a large country in south Asia is comprehensive and articulate in its evaluation of the technical aspects for various biomass conversion systems. To quote from the oil and gas document cited above, the report is diligent in its "...comparison of alternative technologies and approaches to...development and infrastructure". The same draft report, however, fails to articulate in such precise detail the necessary financial justifications or, for that matter, the critical institutional framework and support that would be necessary to undertake outlined investments. In terms of an analogy, it would be impossible to justify investment in an oil refinery or gas-fired power system, i.e.

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[10] World Bank, Managing Gas Industry Development, op. cit., p. 22

the technical components of oil and gas development evaluations, without a precise and integrated view of the upstream supply and critical downstream parameters.

3.5 The draft report on biomass commercialization mentioned is by no means an isolated case. Emphasis in numerous studies and evaluations that are intended to promote biomass commercialization tend to be overly technical and focused on precisely such issues as "maximum operating pressure, safety regulation, unit measurement", etc. In brief, the other critical upstream and downstream components, i.e. supply data, financial analysis, and critical institutional parameters are less rigorous. This is not to undermine or diminish the need for competent technical assessments. Rather it is meant to stress the need for balance and thorough evaluation of the integrated components and the linkages necessary if commercial biomass development is to succeed.

3.6 The statement below summarizes a standard appraisal approach advocated for natural gas development. The main themes are directly applicable to biomass commercialization and lend insight into the linkages and cooperation that would have to be mandatory:

> The need for this parallel appraisal of the prospective markets and of the production potential of the known fields implies a series of iterations until an optimum program of development is selected. Once a program is agreed upon, the engineering, financing and institutional arrangements particular to each link in the chain from field development to final use must be coordinated. The interdependence of the producer, the gas transmission/distribution company and the user...requires a high degree of commitment from all partners and particularly the government.[11]

3.7 In a similar manner, the interdependence of the supplier, the prospective producer and the energy user requires this same "high degree of commitment" for successful biomass commercialization. What often characterizes the biomass development process, however, is precisely the lack of linkages, certitude and commitment. Again, the draft technical report mentioned above where project lending for biomass commercialization is being considered, is a good example.

3.8 In the draft report, the basic data on biomass supply, environmental sustainability, pricing and energy equivalents, i.e. the critical upstream parameters, while addressed are, at best, weak in comparison to the technical analysis. In addition, there is stated uncertainty with regards to transportation mechanisms and costs. The weaker analyses in these upstream areas compounds the problem of designing specific and appropriate technical solutions. Thus, given uncertainty in these critical components, the technical analysis tends to abound with engineering possibilities, i.e. retrofits, cogeneration, new technologies, etc. In brief, however, the technical analysis, with its array of technical possibilities, is but technical conjecture since the other critical components or linkages remain vague or unknown.

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[11] Ibid. p 18 - 21.

3.9 Integration in Composite Assessment. Similar to the oil and gas development process outlined above, successful biomass commercialization will require reliable supply data, precise and appropriate technical options, understanding of critical downstream linkages, as well as defined institutional analysis and commitment on the part of participating entities. Again, the point here is not to criticize or downplay the need for technical evaluations. To the contrary, the technical analysis must be precise and appropriate and, most important, suited for follow-up investment. However, the technical evaluation can only be as good as the composite project information available, i.e. other critical upstream and downstream components. Based on reliable and composite information, the most appropriate, efficient and cost effective technical solutions are those designed to coincide with the composite project reality encountered.

3.10 Finally, the approach advocated here is that the best technical designs for biomass commercialization are those that are developed to meet the site-specific biomass resource/energy characteristics encountered, along with market and institutional realities. To proceed without this composite and specific information -- or outside an integrated evaluation framework -- will result in either an array of technical possibilities or worse, inappropriate system design. As numerous projects throughout the developing world have shown, the problem with inappropriate technical schemes, e.g. those divorced from the upstream/downstream realities in which they are situated, can be disastrous in financial and economic terms. Fundamentally, the real danger here is that it is the developing countries that have and will continue to pay for such mistakes.

4. FINANCIAL/ECONOMIC ANALYSES

Demonstration of Prospective Financial/Economic Benefits

4.1 In terms of perceptions of the viability of biomass commercialization, the financial/economic analysis is critical in demonstrating the prospective financial benefits that can proceed from coherent programs and projects. The financial/economic analysis component of the integrated assessment process is also crucial in activating investments, whether on the part of government, bilateral and multilateral donors, and/or the private sector groups.

4.2 Standardized Approach and Project Integration. There are two main points related to the above-cited observations that need to be stressed: i) the financial/economic analysis should, to the extent possible, utilize standard approaches to project financial/economic evaluation, borrowing from the evaluation framework used in project appraisals for the commercial energy sector; and ii) this component analysis is critically dependent on and must synthesize data from both the upstream and downstream evaluation process. Like the other analyses components, the financial/economic analysis is, therefore, a critical link in the development chain. A brief elaboration on these points follows.

4.3 First, as noted in Section II, the financial/economic analysis is the assessment component that can most alter the perceptions of government authorities, as well as other key parties, i.e. bilateral, multilateral and private sector participants. Indeed, if the project holds prospective merit, the financial evaluation can demonstrate the financial benefits that can proceed from successful commercialization. In fact, investment decisions are generally predicated on a project's financial analysis as it becomes the main reference for investment decisions.

4.4 Financial vs. Economic. At the outset, for policy makers it is important to establish the distinct differences between the two financial evaluations that constitute a financial/economic analysis. That is, this component is really two distinct evaluations carried out in two stages. Stage one -- financial profitability -- produces an estimate of the project's financial profit or...the net present value of the project when all inputs are measured at market prices.[12] Following this, the economic analysis considers prospective market price distortions in project evaluations, thus analyzing and revealing the benefits of a project in the context of the macroeconomic conditions that prevail. To the extent possible, the economic analysis considers the profit or loss to the country as a whole. The differences here for policy makers are crucial. Investment decisions on biomass commercialization need to view projects in light of both perspectives. Indeed, in many developing countries price distortions on commercial fuels will result in financial assessments that show biomass projects as being "non-viable". Again, investment decisions must also take into account the economic assessment of such projects.

4.5 While it is outside the scope of this section to detail how financial/economic evaluations for biomass projects should be undertaken, and project analysis is far to diverse to allow a single procedure, the main recommendation here is straightforward: the financial/economic analysis, to the extent possible, should follow a methodological approach for standard financial/economic appraisals used for commercial energy sector project lending. This is advocated in the belief that a standardized approach to analysis -- with necessary modifications for the characteristics of biomass -- accomplishes two main objectives: i) it lends more easily to ranking of prospective biomass investments within a country; and ii) gives a form of analytical assurance and credibility to the project evaluation process. Most important, when well executed the financial analysis can identify projects that should be targeted for investment.

4.6 Oil and Gas Comparison. In terms of a general methodological approach, the oil and gas development process once again offers an interesting comparison.[13] The following, paraphrased here for biomass development, mirrors the general analytical framework recommended from the World Bank manual on managing gas industry development in developing countries:

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12 J. Hansen, Guide to Practical Project Appraisal, Social Benefit-Cost Analysis in Developing Countries. United Nations Industrial Development Organization, United Nations, 1978, p. 8.

13 For a general methodological approach to evaluating demand, supply and energy equivalent data for the biomass sector, see: Gerald Leach and Marcia Gowen, "Household Energy Handbook", World Bank Technical Paper No. 67, 1987.

Methodology. There are three general areas that biomass utilization project evaluation should cover. First, it should develop a profile over time of the aggregate demand/supply balance for the resource of interest. This sectoral context is necessary in order to derive one or more scenarios for the financial and economic price and/or the value of the biomass fuel over the relevant time period. Second it should identify, evaluate and rank alternative technical packages for biomass utilization using project and project-related investment data. This project evaluation analysis will also include and be based on the biomass price scenarios derived from aggregate sectoral work. Third, consistency checking and sensitivity analysis should be undertaken to highlight any necessary revisions to the preceding two areas (and possible additional iterations) and to identify critical design issues or information gaps that need to be filled before feasibility analysis and investment paths are decide upon.[14]

4.7 While the three project phases necessary for project evaluation can be elaborated on in great detail, the main point here is that the financial/economic analysis should be set in a general and, to the extent possible, standardized framework. Commonly, NPV, Cost/Benefit and/or IRR assessments are standard financial/economic analytical frameworks that are used and that illuminate prospective project benefits. Perhaps most important, well-designed analysis in this component area can be used to change perceptions about the profitability in the sub-sector and, in turn, stimulate necessary investments.

4.8 Training. In light of the above, a necessary component of general program development in developing countries should be training and practical application in financial/economic analyses. Such training programs, using accepted project evaluation approaches utilized in the commercial energy sector, could provide for the development of a coherent and standardized analytical framework. Such a framework would, of course, be tailored for biomass projects, e.g. taking into consideration linkages to the environmental costs/benefits proceeding from project commercialization.

4.9 The second key point that follows from these observations is that, like the supply, technical and institutional analyses, the financial/economic evaluation must be seen as a integrated link in the overall development and commercialization chain. As noted in three phase approach outlined above, the financial/economic data utilized is critically linked to the upstream and downstream project realities. In particular, the financial/economic evaluation will not only require reliable upstream data, e.g. resource data and associated costs, transport costs, environmental costs/benefits, etc., but will clearly have to probe and analyze the market uses and viability of any energy generated, e.g. a biomass-based power project. As with the technical analysis, the financial/economic evaluation will only be accurate and reliable if integrated with the composite upstream and downstream aspects of the project.

[14] World Bank, Managing Gas Industry Development, op. cit., p. 70

4.10 In terms of the financial/economic evaluation, what clearly is required to support project commercialization is a financial/economic evaluation that is integrated within the composite assessment process. As often happens, however, individual experts are fielded to develop their respective data and analysis without close linkages to other project components and analyses. The following is recommended for natural gas utilization studies (GUS) in developing countries. The statement is, however, directly applicable to the biomass assessment process if viable commercialization is to proceed:

> Because of the many linkages between technical and economic analysis and data in the methodology, implementation of a gas utilization study does not readily lend itself to a clear division of responsibilities among individual team members. Rather, it needs continual interaction between engineering and economic staff so that each develops data and estimates of individual parameters as the other needs it, and so that the timing of each be appropriately directed toward the elements critical for the overall study. A small, multidisciplinary core team supported by technical specialist as needed, is probably a better organizational framework for a GUS than either an engineering or an economics-based lead team with support of the other.[15]

4.11 In brief, a policy instrument for governments planners seeking to commercialize biomass is the critical need for a "multidisciplinary" approach to project development. Indeed, because of the complex linkages that also characterize biomass, commercialization will only be successful if developed through this integrated development framework.

5. INSTITUTIONAL ASSESSMENT

Weak Institutional Framework and Commitment

5.1 As stated at the outset of this paper, the key question that continues to confront this Expert Consultation group is why the biomass resource base found in the developing countries is not being more effectively harnessed and utilized for commercial energy purposes. There is, however, another question that must be asked in order to effectively address the issue. That is: is there a solid institutional framework in place in these countries that can promote and support effective biomass commercialization, including the development of coherent analyses and subsequent investments in the sub-sector?

5.2 This paper contends that it is the institutional setting that is perhaps the most often overlooked in the biomass evaluation, development and commercialization process. Indeed, like the oil and gas sub-sectors, a designated government institution should, at least, be: i) the responsible catalyst in the integrated chain of development; ii) have a sustained role if commercialization of biomass is to succeed; and iii) have effective institutional power to promote and develop viable

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[15] Ibid. p. 86

programs and projects. While certainly not the only player, the government unquestionably needs to define the institutional framework, including the rules for itself, as well as for the other participating agencies and entities, e.g. private sector, multilateral donor groups, etc. This section addresses some of the critical points related to the institutional setting conducive to biomass commercialization.

5.3 Country Commitment. First, for commercialization to be effective there must be a genuine willingness on the part of the country to seriously address the biomass energy sub-sector. Gauging such willingness and the existing institutional framework should also be the first priority in an institutional analysis related to biomass programs and projects. General verbal commitments on the part of government, while useful, will not induce successful biomass commercialization. Currently, this willingness can be tested, in part, by the level of the government counterparts associated with biomass development efforts.

5.4 As noted earlier, in most developing countries there is no department or division of biomass in the energy ministries handling the composite development and commercialization process. Evaluation and commercialization efforts are often dispersed and uncoordinated. Often times competing interests are found between agricultural, energy and environmental ministries when dealing with even upstream biomass issues. This, in turn, leads to confusion in prospective project identification and development when what is required is clarity, particularly in terms of institutional responsibilities and support. By contrast, for investment to be mobilized for the oil and gas sub-sectors, institutional responsibilities are clearly defined, with each entity knowing its critical role and responsibilities.

5.5 The following, excerpted from the World Bank's recommendations on the institutional parameters necessary for natural gas development and commercialization, is applicable to biomass development and illuminates the need for strong institutional support:

> Institutional Requirements. In view of the complexity of the issues involved in gas development, both in resource and market areas, a strong institution with expertise in natural gas must be developed (in the case of a country setting out on gas development). This institution would be in charge of all activities for developing the most viable production/marketing options. Such activities include negotiating contracts with producers, large domestic consumers...transporting, distributing and marketing gas; and implementing any policies decided upon at the government level.[16]

5.6 While this paper is not recommending that a huge government institution(s) be created, the point is that "a strong institution with expertise" in biomass development is required if the sub-sector is to be effectively understood and developed. Biomass management and commercialization in developing countries will simply not occur without a form of strong and sustained institutional support. In brief, there must be a willingness at the national level,

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16 World Bank, Managing Gas Industry Development, op. cit., p. 86

expressed through a viable institution(s), to promote analyses, development, investment and general commercialization in the sub-sector. As mentioned earlier, given the priority on environmental issues that dominates the development agenda of the 1990's, it is amazing that there is generally weak institutional support in developing countries for biomass, despite the clear linkages between environmental management and biomass resource development.

5.7 In any institutional setting related to biomass, however, too much centralization can be obstructive. That is, in most countries it is important that there be regional authority to actually promote effective analyses, development and commercialization of biomass resources. Indeed, in regions in developing countries where biomass resources are abundant it can be efficient and expedient to delegate regional authority for decisions on evaluation and project development. Ideally, the national institution dedicated to biomass management and commercialization should be a central clearing point for all interested entities for data, expertise, and intra-governmental assistance and cooperation, as well as for leveraging bilateral and multilateral technical assistance and support. The designated institution should be part of the solution to effective biomass commercialization. Due to bureaucratic issues of authority or jurisdiction, it should not be part of the problem.

5.8 Operating Role. While the precise operating role of any institution dealing with biomass development and commercialization is country-specific, the point is that a strong institution should be the operating, institutional catalyst for the sub-sector's development. Again, for institutional development in the natural gas sub-sector, the following is recommended and can be applied, in part, to the institutional support necessary for biomass commercialization:

> If this gas development institution succeeds in developing any gas project, a permanent gas operating entity should be established where the development institution would evolve into its operating unit. This entity can be partly or wholly owned by the government or can be privately owned and managed...In both cases, however, the government will have an important function in establishing the rules and regulations within which the company should operate both financially and technically. As an operating entity, the institution would be concerned with gas availability/utilization, pricing, and consumer rules and regulations, safety codes and standards, training, and availability of services, materials...[17]

5.9 Need to Establish Guidelines for Commercialization of Biomass Energy. Similar to natural gas development and commercialization, government will have a key role in establishing the guidelines through which biomass development and commercialization should take place. This should not only include the designation of authority to the appropriate national/regional institution -- accompanied by the necessary financial support for these institutions -- but should also provide the rules and operating framework for other key parties, i.e. bilateral, multilateral, private sector entities, that actively participate in the process. The institutional framework is critical and should outline everything

[17] Ibid. p. 86

from guidelines in developing and organizing data, i.e. the upstream parameters, to market opportunities, i.e. the downstream parameters, including a legal operating framework and financial signals and incentives necessary to actually promote commercial development of the sector.

5.10 In regards to the latter two points, i.e. legal and financial parameters, it is in these respective institutional areas that governments hold perhaps the most direct ability to markedly influence the commercial development of the sub-sector. In fact, in these areas, a government can be a direct catalyst for biomass development and commercialization.

5.11 Legal Initiatives. In the examples cited previously of private power sales in Costa Rica and the United States, what was required in both cases was primarily direct legal commitment on the part of government, enacted through legislation and accompanied through direct and leveraged financial support, that stimulated the private sector movements toward biomass commercialization. As is well known, in many developing countries there are tight restrictions on the rights to generate and sell electricity. Often these laws and accompanying restrictions have, in many cases, created virtual state monopolies in the power sector while at the same time, impeding the development of private power sector initiatives.

5.12 Under such legal restrictions, private sector biomass-based power initiatives must basically be designed and assessed under scenarios of captive power. Such restrictions not only limit prospective development opportunities -- e.g. enhanced project viability through surplus power sales to existing grids or other industries -- but can effectively stifle investment. This situation is particularly difficult to comprehend in rural regions in developing countries that are experiencing power shortages, e.g. remote areas in Indonesia where residues from wood mills could prospectively be used for power generation to supplement existing regional electric grids, or where the costs of commercial fossil fuels are much higher that what could be provided through local, biomass-based systems.

5.13 While certainly deserving of detailed evaluation in both the financial and institutional analyses, often times existing tariff structures found in the power sector of developing countries can impede the development of biomass-based power systems. This situation can be particularly frustrating where national or regional utilities are operating at rates that do not reflect real costs. In many cases biomass commercialization for power generation is forced to compete with subsidized rates, with negative impact on the financial viability of projects.

5.14 Financing. In those cases where there is a coherent legal framework providing incentives for commercial biomass energy development, such as in the mentioned case of Costa Rica, often the "institutional" stumbling block is financial, e.g. access to concessionary or long-term lending that could actually stimulate biomass project development on the part of regional entities or the private sector. In many countries the situation is ironic: as governments discuss the need for more prolific management and commercialization of biomass for commercial energy, key obstacles are governments' own legal restrictions or limitations on the ability to obtain credit. While the latter is not strictly a "government obstacle",

governments certainly could do a great deal to assist in the facilitation of financing or lines of credit for programs and projects deemed viable and which are recognized national priorities.

5.15 Yet to think that an institution or institutional framework alone will resolve the problem associated with biomass development and commercialization is naive. The responsibility of the government in promoting biomass commercialization does not end with the establishment of an institution or definition of institutional roles and responsibilities for other parties, i,e, the private sector. Indeed, this would be too easy a solution.

5.16 Instead, institutional commitment and support can be considered among the required first steps in terms of the "institutional parameters" necessary for the enhanced development and commercialization of biomass resources. As noted, crucial components that fall under the institutional framework that need to be defined include: i) a coherent legal framework that establishes the rules and regulations for participants; and ii) the financial framework necessary to actively support biomass commercialization.

5.17 For the above-noted components, governments hold a strategic position in terms of acquiring necessary technical assistance, as well as in providing financial incentives and financing. First, in terms of effective legal frameworks that have promoted private power development that include biomass commercialization, there is legal expertise available from other developing, as well as developed countries that have dealt effectively with these issues, e.g. Chile, Costa Rica, United States, Great Britain. Such expertise can be procured through both bilateral and multilateral support and applied in developing/enhancing institutional frameworks for biomass commercialization.

5.18 In the case of financing, governments hold the ability to leverage bilateral and multilateral assistance, particularly in areas that are deemed national priorities. Such assistance can be provided for on-lending from commercial and/or government institutions for viable project development. In addition, environmental funding sources can also be leveraged to assist with programs and projects that promote effective resource management/utilization.

5.19 Institutional Responsibility. In a macro framework, perhaps the key responsibility that the institution designated to promote biomass development and commercialization will have to assume, in addition to defining the immediate institutional areas outlined above, is that of general oversight and sustained effort. That is, more than the other prospective entities in the biomass development process, e.g. other governmental or non-governmental agencies, private sector participants, multilateral and bilateral donors, this principal institution will need to view the entire development process as an integrated chain of activities if development and commercialization efforts are to proceed. From guidelines for and the organization of resource data, to outlining market signal, to the institutional support required, the institutional entity will need to have a vision of the composite picture and the linkages that must assessed and solidified if commercialization is to move ahead.

6. SPECIFIC CASES

Lack of Composite and Integrated Analyses

6.1 The three cases briefly outlined below represent examples of biomass-based projects that currently offer or have offered the prospects for biomass management and commercialization. In all three cases, however, it can be said that certain linkages in the necessary chain of development were weak or failed to be considered in adequate detail. That is, in broad terms the evaluation processes failed to evaluate and develop one or more individual components of the composite upstream and downstream process required for successful project commercialization. The results, unfortunately, have not only been the loss in technical and financial resources, e.g. the time and efforts invested in these prospective projects, but missed commercial opportunities for the respective governments and participating entities.

Latin America - Mexico. A commercial charcoal production and integrated reforestation project has been proposed and developed by private sector entities. The venture, including a sizeable reforestation component, was a follow-up and based, in part, on a pre-feasibility analysis developed by multilateral sources.[18] The project has been diligent in its analysis of the resource supply/management program, appropriate conversion systems, commercial markets, as well as the general institutional setting, e.g. support of participating rural cooperatives, government permits, technical support, etc. Yet while the project offers the prospect for temperate climate forest management, product commercialization (including export earnings), technology transfers and institutional training -- all to be conducted by the private sector -- it has failed to reach the implementation phase. In brief, the venture has been halted due to delay in commercial financing considerations. In fact, while the host government has advocated its support for private sector initiatives in the forest management and commercialization, it is precisely a government line of credit (along with a commercial bank counterpart loan) that has mired and seriously delayed the entire effort. In brief, the necessary financial linkage/support, by not being in place, has stifled the project's initiation and perhaps initiative.

Southeast Asia - Indonesia. By any standards, the biomass resource potential for commercial energy generation is large, and most important, indigenous and renewable -- views that have been confirmed by among others, the World Bank, since the late 1970's. Of particular interest, bagasse from sugar production offers a potentially large resource for expanded commercial energy generation. While numerous mills in Indonesia supply their own power needs, the prospect for enhanced generation from surplus bagasse for commercial power sales has been a keen and on-going interest of government and bilateral donors. In fact, most recently, a 1991 bilateral donor-funded study analyzed in great

[18] World Bank, Mexico, Improved Charcoal Production within Forest Management for the State of Veracruz, (Report No. 138/91) August 1991.

detail the technical prospects for power generation at four individual mills, with surplus power capacities at these mills ranging from 6 to 33 MW.[19] The problem, however, is that while the technical studies for prospective energy generation, i.e. engineering analyses, are detailed and precise, there has not been the necessary financial or institutional analyses or development necessary to allow effective project commercialization. Indeed, while the government projects double-digit demand growth per year for power consumption, and moves ahead with investments in the commercial energy sector, financial and institutional support for the outlined renewable project development and commercialization remain weak.

Africa - Rwanda. An integrated forestry development project was promoted with multilateral technical and financial support. The project included components to strengthen forestry services, develop plantations to supply charcoal, firewood & building poles, promote rural woodlots to supply the same, and develop a complementary forestry/livestock program. While on paper, the technical components of the project were well designed, the project basically failed in that proper institutional framework to support the project was extremely weak. In addition, under the institutional component, the project design did not adequately incorporate or account for the perspective of woodlot owners who, in fact, were intended project beneficiaries. The case was clearly one an inadequate institutional framework to support the venture.

7. CONCLUSIONS AND RECOMMENDATIONS

Summary and Conclusions

7.1 This paper poses a key question to the Conference participants: why the biomass resource base found in the developing countries is not being more effectively harnessed and utilized for commercial energy purposes? Indeed, the paper contends that a more serious commitment to and investment in the sub-sector would show a better understanding of supply and demand patterns and a significant contribution to commercial energy from biomass. Yet what is lacking is a composite, analytical approach to the sub-sector.

7.2 Need for Composite and Integrated Policy Framework. That is, what is lacking in biomass program and project assessment and commercialization is a coherent and composite policy framework that allows effective analysis, efficient development and commercialization of biomass energy programs and projects. In part, it is the analytical, policy framework used for commercial energy analysis and investment that can also be effective in the commercialization of biomass resources. In order to have significant commercial impact, the sub-sector must be diligently addressed in a broad policy framework that insists upon and

[19] Winrock International, "Diversification of Sugar and Palm Oil Industries: Indonesia. Part II: Case Studies of Sugar Industry Electricity Production for Export", for USAID, 1991.

encompasses integrated analyses in the following areas: (i) supply analysis; (ii) technical evaluation; (iii) financial/economic analysis; as well as (iv) institutional analysis -- that latter of which defines, among other issues, mechanisms that allow national and international entities, including the private sector, to participate in and promote sustained follow-up and investment. In terms familiar to the oil and gas industry, it is the composite upstream and downstream parameters that must be effectively addressed in an integrated framework.

7.3 Supply Analysis. The dearth of supply data is the foremost problem confronting this phase of the assessment process. One of the first steps in developing coherent and organized data is to change government and the private sector perceptions of the importance of the sector. This can best be accomplished, in part, through examples of viable project development. This, of course will require strong government commitment. Secondly, reliable data development can be stimulated by linking resource management with biomass resource development.

7.4 Technical Analysis. In most biomass program and project development, the technical analyses tend to dominate the assessment process. The contention here is that the technical analysis must build on both upstream and downstream data. Indeed, the approach advocated here is that the best technical designs are those that are developed based on the site-specific biomass resource/energy characteristics encountered, along with market and institutional realities. The costs of inappropriate technical schemes are borne by the developing countries.

7.5 Financial/Economic Analysis. The financial/economic analysis is the assessment process that can most alter perceptions of governments, as well as other key parties, if well designed and executed. The paper proposes two main points: i) the financial/economic analysis should, to the extent possible, utilize standard approaches to project financial/economic evaluation, borrowing from the evaluation framework used in project appraisals for the commercial energy sector, while being tailored to project realities, e.g. environmental costs/benefits ; and ii) this component analysis is critically dependent on and must synthesize data from both the upstream and downstream evaluation process. Like the other analyses components, the financial/economic analysis is, therefore, a critical link in the development chain.

7.6 Institutional Assessment. This paper contends that it is the institutional setting that is perhaps the most often overlooked in the biomass evaluation, development and commercialization process. Like the oil and gas sub-sectors, a designated government institution should, at least, be: i) the responsible catalyst in the integrated chain of development; ii) have a sustained role if commercialization of biomass is to succeed; and iii) have effective institutional power to promote and develop viable programs and projects.

7.7 Again, in a macro framework, perhaps the key responsibility that the institution designated to promote biomass development and commercialization will have to assume, in addition to defining the immediate institutional areas outlined above, is that of general oversight and sustained effort. That is, more than the other prospective entities in the biomass development process, e.g. other governmental or non-governmental agencies, private sector participants, multilateral and bilateral donors, this principal institution will need to view the entire development process as an integrated chain of activities if development and commercialization efforts are to proceed. From guidelines for and the organization of resource data, to outlining market signal, to the institutional support required, the institutional entity will need to have a vision of the composite picture and the linkages that must assessed and solidified if commercialization is to move ahead.

Participatory Land Use Planning in Social Forestry

by

Uraivan Tan-Kim-Yong[1]

1. INTRODUCTION

The efficacy of forest protection through resettlement of villagers living in forest lands, and of reforestation strategies without consulting these villagers, have become increasingly questioned (Uraivan 1989 and 1990; Carson, 1990).

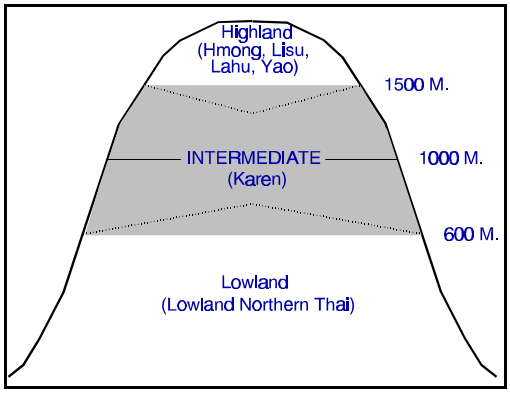
Alternative strategies to improve the management of natural resources are being developed in many countries, also in Thailand. A Social Forestry pilot project has been implemented in collaboration between the Royal Forest Department (RFD) and Chiang Mai University (CMU), for four years in Northern Thailand, with Ford Foundation support.

One key tool developed, tested and applied in this pilot project is 'participatory land use planning', in which local group formation for natural resource management is a central element.

As elaborated in this paper, this emphasis on the sociological dimension of land use planning leads to a methodology that differs considerably from the way land use planning is often carried out.

1.1 The Setting: Resource Management Crisis in the Intermediate Zone in Northern Thailand

Over half of the 600,000 people of ethnic minorities residing in the hills of North Thailand are Karen, who live in the intermediate zone of 600 to 1,500 meter a.s.l. Population growth, compounded by in-migration from both the highlands and the lowlands into this intermediate zone, have contributed to increasing pressure on the natural resources (forest, land and water). This is reflected in a number of common problems in the intermediate zone.



Resource Pressure in the Intermediate Zone

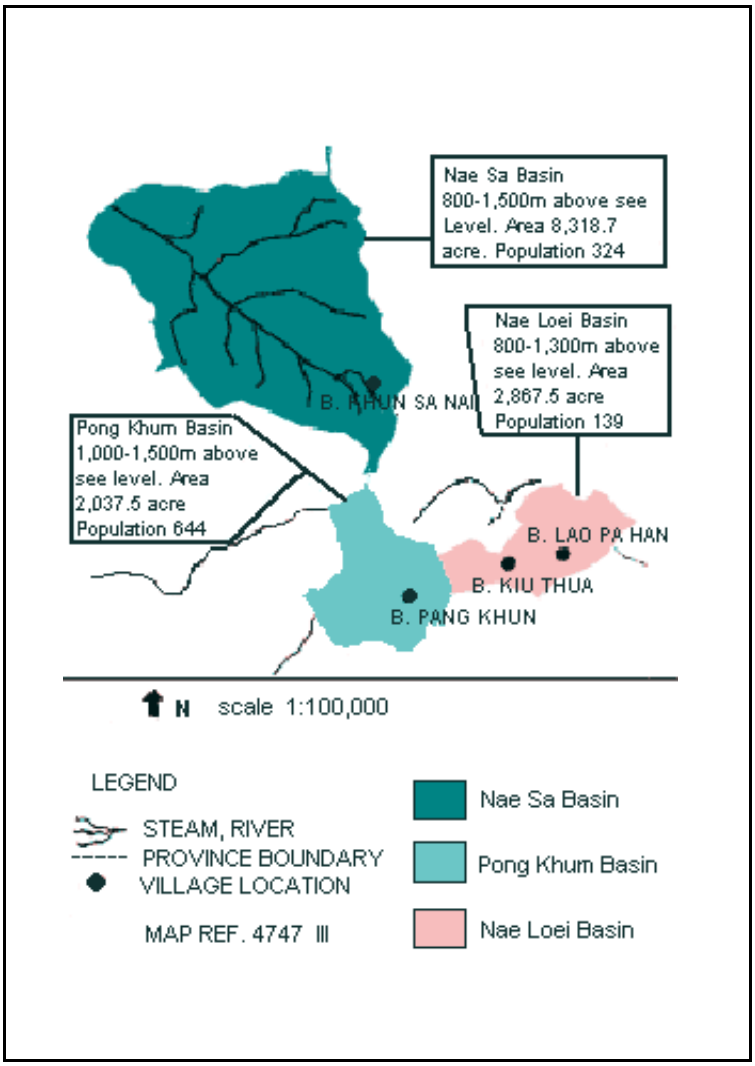
[1] Resource Management and Development Program (RMDP), Faculty of Social Sciences, Chiang Mai University, in collaboration with the Royal Forest Department, Thailand and the Ford Foundation.

1. Increasing competition for forest resources leading to conflicts between the various ethnic groups;
2. Irrelevance of public policies, laws and regulations for local resource problems;
3. Contributing to alienation between the villagers and public land management agencies, such as RFD;
4. Erosion of indigenous resource management institutions;
5. Increase of landlessness amongst hill farmers.

Based on earlier research, it has been suggested that priority should be given to addressing these problems in the intermediate zone in regional development activities in the North (Uraivan, 1987).

1.2 Social Forestry Pilot Sites, Northern Thailand

A pilot scale, community management strategies to address these issues, have been carried out in three sites in Northern Thailand since 1987.



All 3 villages are located in the 1,200 to 1,500 meter zone. In Pang Khum the situation is dominated by a growing conflict between the Karen and Lisu people; in Khun Sa Nai, Hmong are the predominant group who have adopted some of the land management practices of the Karen. Kue Thuai is a village of lowland Northern Thai (or "Khonmuang") who migrated into this area over 50 years ago. They grow a.o. *miang* or green tea for the local markets in the northern cites.

The cultural and ecological differences between these sites are reflected in a diversity of resource management problems and strategies.

As the table shows, there are also large differences between the sites, in terms of ethnic background, resource pressure, ecological setting and government forest and policy.

Village	Basin Area (rai)	Alti-tude (m)	W.S. class	Cult land	Tree cover	Thin. h.h.	Av. h.h. size	Reli-gion	Av. land	% land-less	Land title
Pang Khum	50,000	1,000-1,500	1A & 2	1,800	380	63 karen 40 lisu	4.6 karen 7.3 lisu	Spirit	K:14 L:7	K:16 L:15	PBT5
Khun Sa Nai	21,000	800-1,500	none	1,900	425	40 Hmong	8.6	Christ	18	17.5	NorSor 2,3 SK1; PBT5,6 STK
Kiu Thuai	7,100	800-1,200	1A	1,100	820	35 Khon-muang	3.7	Bhudh.	30	28.6	SK1 PBT5,6

Note: Areas are in rai (1 acre = 6.25 rai); W.S. class = Watershed Management Classification

1.3 Social Forestry Issues and Strategies in Pilot Sites

To address both the general and the locally specific problems in these situations a four pronged approach is pursued: land-use planning; formation of community management organization; agroforestry; and community forestry resource management strategies.

Pang Khum is the largest village of the three, with 103 households, belonging to two ethnic groups, Karen and Lisu, the average land holding is between 7 to 14 rai, and there is a high degree of intergroup conflict pertaining to land.

Community forestry activities in this area comprise three community management activities on 300 rai:

conservation of watershed protection forest
management of grazing in the forest
management of common lands

And two activities at household level covering 280 rai:

* fuelwood production
* homegarden development

The target categories and groups in this area, comprise:

= poor households,
= farmers cultivating outside the watershed area
= nursery group
= community forest management group for forest conservation
= kinship groups

Khun Sa Nai is a village located in a small basin in Mae Hong Son Province. Their area does not fall under the strict watershed management regulations as in the other two villages, allowing the Royal Forest Department (RFD) a greater flexibility and the Hmong households a greater security in land use. The Hmong moved into this village about 30 years ago. They bought irrigated land from the original Karen inhabitants, from whom they also adopted the sustainable wet rice valley cultivation system and some of the Karen forest conservation practices. It seems that their dependence on irrigation water has much contributed to their forest conservation practices along streams. Due to population growth they now expand their fields on sloping land.

Community management activities on 350 rai, are the same as in Pang Khum, but at household level activities, covering 120 rai, differ:

* agroforestry interventions in cabbage fields on slopping lands
* demonstration plots

Here target groups comprise: poor and landless households; an agroforestry group; cabbage cultivators; a nursery group; and farmers cultivating outside the watershed area.

Kiu Thuai is inhabited by lowlanders or *Khonmuang* who migrated into the area over 50 years ago. They grow and produce green tea *(miang)* in a sustainable manner according to agroforestry practices. Landless farmers are seeking year round employment in these areas, and there is some concern that they may start cultivating in forest areas. The other concern of the Forest Department is the high fuelwood use in *miang* processing, that is exerting some pressure on the forest resources.

In community management there is in this village, in addition to the conservation of watershed forests and community management of common lands as applied in the other villages:

fuelwood forest management (200 rai)

Also at household level (on 90 rai) there is a difference in emphasis:

* improvement of teagarden
* promotion of trees for fuelwood and other needs

Target categories include here: poor households, farmers operating teagardens, kinship groups, nursery groups as well as individual households operating a nursery.

The above overview demonstrates both the shared problems and strategies, as well as the problems and opportunities that are particular for a certain area and require a different strategy.

These new initiatives in resource management are the result of a long process of **negotiation**, in which Community Organizers have played a crucial role.

Their activities included the following:

1. Stimulating villagers' interest in general land use and forest management issues and problems;

2. Improve the identification and understanding of specific forest management problems, land use conflicts and environmental problems;

3. Reorientation of the various parties and of their expectations.

4. Encouraging frequent community and group meetings to respond to seasonal problems;

5. Improve the procedures for meetings and decision-making by local groups;

6. Facilitate the combining of the strengths of new and old forms of leadership;

7. Increase the visibility of functional groups in the community;

8. Encourage partnership amongst villagers and between ethnic groups;

9. Promotion of local organizations and agreements in social forestry;

10. Improve procedures for organizational development and community management.

To identify the problems and the ways to address them a local level land use planning methodology was developed....., but the method goes beyond that. It is as much a tool for mutual learning and encourages the formation of local organizations in the process.

1.4 Participatory Land Use Planning (PLP)

PLP is a 'tool' or rather a process through which conditions are created for frequent communication and discussions, thereby contributing to the strengthening of the institutional basis of local organizations. The common understanding of the issues forms the basis of agreement on rights and responsibilities in the implementation of forest and tree-management activities.

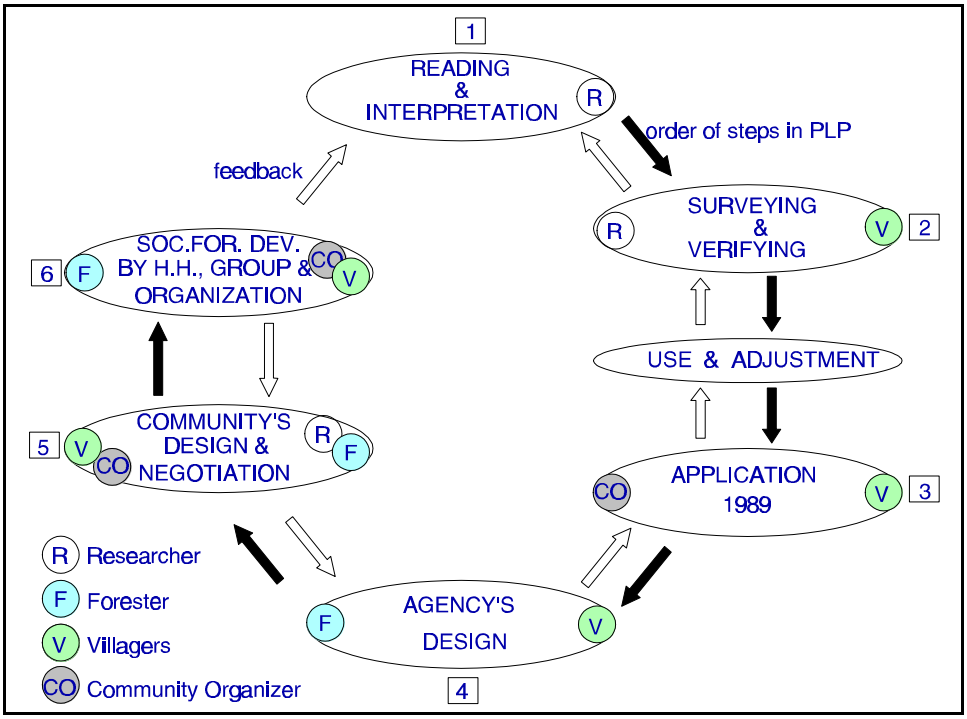
PLP is a process involving the Royal Forest Department and villagers in communication that gradually focusses on mutually acceptable land management strategies which the assistance of university-and village-based facilitators.

Thus compromises are forged in which the needs of the villagers are met through adaptation and compromise in RFD's strategies to achieve forest policy objectives, through improvement of land use practices, user rights, and compromises in the conflicting interest of various local groups. In the process, both the villagers and the land management agency

(RFD) gradually redefine their expectations and thereby their relationships. One of the central PLP principles is that all relevant information is hired and accessible for all parties. Hence there is much emphasis in PLP on appropriate visual techniques for this purpose. In the pilot activities in the three villages, the following six steps in the PLP can be distinguished:

1.4.1 Reading and Interpretation of Maps and Aerial Photographs

The first step comprised the preparation of materials, tools, and a field survey design. All physical maps and aerial photographs available were studied to find the best and most recent ones. An experienced geographer worked out the base maps and interpreted the aerial photos with the assistance of a technician in the office. A topographic map and aerial photos at a scale of 1:5,000 were prepared for each site (village, district, basin, public forest, etc.). The same team also worked out the survey design.



Six Steps in the Participatory Landuse Planning Process

1.4.2 Survey and Verification

With the assistance of a forester from the field unit or of a community organizer with good local knowledge, the research team, in close collaboration with the villagers updated the map on the basis of observed current land use. It was attempted to identify all scattered clearings and newly opened forest areas for cultivation. Also, detailed information of forest land, preserved areas, land use patterns and ownership were recorded. Every day some villagers joined the team, thereby stimulating discussions on land uses and problems.

The topographic maps and aerial photographs helped much in the exchange of information and establishing a focus on common problems. Relevant issues are recorded on the base map and discussed in a meeting. These meetings were well attended as villagers had been actively involved in identifying the issues. In addition to increasing the accuracy of the base map, the meetings contributed much in initiating discussion of problems and the emergence of compromises in the definition of these. The updated and community-verified map was subsequently used by the community organizer in the planning and design of land use development activities and in agroforestry development.

1.4.3 Field Application

The Community Organizers were able to identify target households and groups and develop some strategies for working with these, based on their participation in and the results of the diagnostic stages. Poor and landless farmers were in all villages included as they are more dependent on forest lands for agricultural purposes than others. The Community Organizers familiarized themselves in more detail with the problems and potentials of these households through visits and informal meetings in small groups. Also at this stage extensive use was made of the base map for the exchange of information and to stimulate the discussion on both problems and solutions, such as new land management techniques in private agricultural land as well as forest management and conservation.

The outcomes of this stage were concrete ideas for improved land use in private land management such as agroforestry interventions for soil conservation and community management of patches of public forest lands. Also some households decided to join in nursery development activities, others in a group to develop sloping agricultural land. Preferred species of trees for fruit, fuel, timber and soil conservation were identify as well. Both new groups were formed to take part in the various activities, as well as existing groups that started be become involved in community management and agroforestry development.

In the process the villagers started to appreciate the community organizers' activities and the new role of the Royal Forest Department.

1.4.4 Agency Design

The Royal Forest Department is administratively charged with the task to formulate forest land use plans. Until recently such plans were often exclusively based on the bio-physical potential and constraints, and the expected market value of the tree crop. Also a fairly rigid set of rules and regulations that specify a package of treatments (or rather more often, limitations to treatments) for a limited number of forest land classes, need often to be adhered to.

For the purpose of the pilot project it was decided to allow for greater flexibility by greater sensitivity to the needs and preferences of the local forest users. Villagers generally expressed their great satisfaction about this more rational and professional way of planning, and this contributed much to their active participation in the next step.

1.4.5 Community Design and Negotiation

Various committees and in some cases all community members discussed their own land use plans based on their experiences acquired in the stages sketched above. Villagers had also understood by now that without their own management plan, prevailing forestry laws and regulations, if inappropriately applied at local level, could seriously constrain their activities.

Villagers's involvement in community forestry and agroforestry activities contributed much to ecologically sound local plans. And this formed a good basis for compromise in the negotiations with the Royal Forest Department to reconcile community and agency land use plans.

1.4.6 Operational Land-Use Plan

The reconciled plans form the operational land use plan, that is guiding the implementation of improved land use practices with the support of the community organizers and field staff of the Royal Forest Department. It is important to emphasize that this plan is not the *basis* for such action; that basis is formed by the common understanding of problems and potentials and more importantly by the social relationship that have been forged in the earlier steps of the planning process, over a period of 2 to 3 years. The Participatory Land Use Planning principles and methods as sketched above, can be applied and adapted for a wide range of conditions and programs. It can however not be used in situations where conditions do not allow for active involvement of the land users in all stages of the process, or the free sharing of information between villagers and outsiders is constrained.

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3. REFERENCES

Carson, B.R., 1985. Aerial Photography as a Base for Village Level Planning in Nepal, Faculty of Geography, Gadyah Mada University, Yogyakarta, Indonesia.

Castillo, Donato Romulo C. del, 1990. Analysis on the Sustainability of a Forest-Tea Production System: A Case Study in Ban Kiu Thuai, Tambon Pa Pae, Amphoe Mae Taeng, Changwat Chiang Mai, Graduate School, Chiang Mai University.

Fox, Jeff, 1987. Aerial Photography and Thematic Maps for Social Forestry, Network paper 20.

Fox, Jeff, 1988. Diagnostic Tools for Social Forestry, Environment and Policy Institute East-West Center.

Jantalert, Busaban, 1991. Karen and Forest: A Variation in Lifetime and Nature, RMDP, Social Sciences, Chiang Mai University.

Jantalert, Busaban, 1989-1990. Monthly Field Operation Report of Social Forestry Project RMDP, Social Sciences, Chiang Mai University.

Prangkiew, Jira, 1990. Map Reading and Application for Resource Management, RMDP, Social Sciences, Chaing Mai University.

Tan-Kim-Yong, Uraivan, 1988. Land-Use Planning and Community Participation in Small Basins, RMDP, Social Sciences, Chiang Mai University.

Tan-Kim-Yong, Uraivan, 1990. The Karen's Way: A Co-Existence of Two Forest Conservation Systems, RMDP, Social Sciences, Chiang Mai University.

Intermediating Between Government Institutions and Programme Beneficiaries in the Implementation of Wood Energy Strategies

by

Malee Suwana-adth[1]

1. INTRODUCTION

The 1992 UN Conference on Environment and Sustainable Development served to highlight the fact that we are living in a world of crisis - not only in term of deteriorating ecological systems but also in term of social and economic stress. While Asia boasts a relatively high economic growth and produce a major portion of some of the world's most essential natural resources, a large number of population - half the population of South Asia and one-sixth of the population of Southeast Asia-live under the poverty line. As control over resources becomes an increasingly important issue in the drive for competitive advantage or, often, just for survival, disagreements and differences in priorities and approaches emerge. Clash over jurisdiction of lands and water between governments and conflicts between government and its own citizens are no longer unusual phenomena in the region.

The exploitation and further development of wood energy is inextricably linked with broader environmental and social issues. The production of fuelwood which is closely linked to forest land use and the utilization of wood energy raise a number of important social and environmental issues. Rural areas in most developing countries of the Asian region area facing increasingly severe and interrelated problems of energy and environment. Growing shortages of traditional fuels, such as wood, are due partly to increased population pressure on land use and
biomass and partly due to the imposition of traditional bureaucratic growth- (rather than people-) oriented planning strategies. At the core of forest resource (mis)management are conflicting attitudes between governments and rural people, especially forest occupants, about who should control these resources and how they should be managed.

In Asia, several attempts have been made to develop methods to respond to such crises and new strategies continue to be explored to cope with rapid social, economic and environmental changes. These range from the empowerment of forest families and villagers with the rights to manage public land to the initiation of the field action project of the Small Farmers Development Program, also known as the Peoples's Participation Program, and the intervention/intermediation of voluntary non-governmental organizations. Successes have been slow, sporadic and not adequately coordinated, propagated nor institutionalized, to provide synergistic force for timely response to the national, regional and global on-slaughts which are taking place at a faster pace.

New people-oriented strategies and approaches need to be found to create changes that would lead towards a life-style and interdependent economic system which contribute to the well-being of the masses of the people and help conserve the environment.

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2. THE NEED FOR INTERMEDIATION (AND INTERVENTION) FOR SOCIAL CHANGES

A large part of the region's people depend on firewood for fuel, and forests are the major source of wood energy for the region's poorest people. Commercial logging, cash crop production for export, and population expansion are primary causes of deforestation in Asia. Although the problem has been recognized and the concern is mounting, still there is no **consensus** on how to manage the problem. While the government has encouraged and supported the commercial exploitation of land resources, government officials often blame rural farmers and villagers for forest destruction and "encroachment". Concerned with the widespread "encroachment" forest lands and the need to implement conservation measures, governments
seek to have forest lands classified for resettlement projects, industrial export zones, privatization, and reserved forests, often without adequate social planning or public information. Rural citizens contend that commercial exploitation does not answer economic needs, arguing for the rights of indigenous people. A large number of village families are removed from their homes for relocation/resettlement without consent nor adequate social preparation and, sometimes, for "security" reason. Conservationists, concerned about loss of biological diversity, often protest over the irresponsible exploitation of forests.

Such diverse and complex social and environmental forces changing the forest lands are becoming emerging concerns in many developing countries in the region. Often, forestry agencies resort to drastic use of force, at times assisted by police and army, in order to maintain control
over the public forest lands. Such drastic action is partly due to conservative traditional attitude and partly to a lack of new tools and skills necessary to cope with rapid social and political changes. Furthermore, governments are slow to recognize local management capacity and rights of local communities and indigenous people. Mutual misconception,mistrust, and lack of communication make it difficult to develop joint vision and share concerns, leading to conflict and, sometimes, confrontation. In addition, while recognizing the importance of forests as a major source of traditional fuels, and construction materials, to the majority of poor people, governments of developing countries still fail to adequately address the issues or provide affordable options to the people.

Most public agencies, including forestry organizations, tend to be conservative and not easily receptive to change. Changing in attitudes can be affected not merely by policy nor directive but by systematic education and learning. Based on many previous experiences in the past two decades, such change can be affected by change agents. Some of the most important roles of the change agent are, in addition to awareness creation, intermediation and, if and when appropriate, intervention.

Lessons learned from several pilot projects on social forestry and small-scale tree plantation and conclusions of major studies on forest resource management strongly support the concept of the role of the change agent in affecting positive changes:

* Findings on the FAO's Small Farmers Development Program in several countries in Asia were that "the function of small group formation and stimulation could best be done by an independent agency, outside of government, which could be counted on to side with the interests of the rural poor.." *(Ledesma, 1991, p.35)*

* "In the case of the Southeast Asian social forestry programs, facilitators have played a catalytic role in the establishment of problem-solving working groups. The facilitator, whether from a forestry organization, university, non-government agency, or donor organization, needs to be sympathetic both to the agency's objectives and the problems experienced by forest communities..." *(Poffenberger (ed), 1992, p.104)*

* In the case of the Agroforestry Livelihood Project in the Philippines, "The GO group should make themselves gradually visible. Initially, a contact person should lay the ground work. This person may be either a GO worker resident in the area or a resident who has established rapport with both the GO and the community..." *(Taylor (ed), 1992, p.100)*

3. WOOD ENERGY CRISIS AND THE RURAL POOR: SOME POLICY ISSUES FOR CONSIDERATION

About half of the world's people cook all or some of their meals with wood and other biomass fuels. Today biomass in all its form meets about 14 percent of the world's energy demand. However, more than 80 percent is consumed in developing countries, where it still accounts for 35 percent of energy supplies and more than is met by coal, oil, gas, or hydropower. In addition to cooking, biomass is also used in small-scale income-generating activities, heating, and other traditional/cultural uses.

For the Southeast Asian nations, the share of traditional fuels in total energy supply declined while the total demand increased. During the period from 1970 to 1985, the decline was 30 to 40 percent in India, the Philippines, and Bangladesh; 45 to 60 percent in Nepal, Malaysia, and Pakistan; and by 81 percent in Thailand. These results indicate that, even in nations where per capita consumption of traditional fuels is declining and the transition to modern fuels is well underway, pressure to use forests and fragile landscape to satisfy energy needs of the rural poor continues, thus prolonging or exacerbating the fuelwood crisis *(World Resource Institute, 1992)*. Biomass, including wood, will continue to be the most important energy source for the majority of rural people in the foreseeable future. Comprehensive energy development programs which include wood energy for the poor are therefore vital to the well-being of rural people of the region.

Current worldwide trade in wood fuel is about 7 billion dollars, and about 2 million people are directly employed full time in producing and marketing it. In spite of the economic and social importance of traditional fuels, such as wood fuel, national statistics on commercial energy production hardly include them for production figures. The same is true for national energy reserves. It is therefore desirable that policies for wood energy be integrated within the framework of national energy policy as well as rural development policy. Additional efforts are needed to facilitate decentralized bottom-up wood energy development planning and management of local resources in a well coordinated and systematic manner.

As making transition from reliance on wood to commercial fuels will be slow and difficult, wood will, in the foreseeable future, continue to be a major energy source for the rural poor. One promising strategy is to involve rural communities in assessing the wood energy need, analyzing the related problems, and in developing village's or community's wood energy development plan for implementation towards self-reliance. Together with the

community's grains reserve, the community's wood energy reserve will provide a basic **food and fuel** reserve security for the community - at the more manageable level and scale.

Although the loss of forest is accelerating throughout the region, the statistical figures indicate nothing of the daily pressures which deforestation and the degradation of forest lands place on women. The scarcity of firewood means more hours spent collecting woods and other biomass. It also leads to changes in energy technologies and cooking or heating habits which can have a negative impacts on women and their families - unless development planners are sensitive to the **gender** issues.

4. THE POTENTIAL CONTRIBUTION OF NON-GOVERNMENTAL ORGANIZATIONS (NGOs)

Generally speaking, non-governmental organizations (NGOs) are diversified in many respects, embracing a large variety of organizations, both formal and non-formal. The majority of NGOs in developing countries in the region are voluntary in nature, non-profit, and committed to social causes for the benefit of the public and/or the disadvantaged. Non-governmental organizations whose members are themselves local beneficiaries and/or based at the grassroot level are normally referred to as people's organizations (POs). NGOs may be created by governments themselves or even by profit-oriented private business sector.

Development-oriented NGOs tend to adopt different approaches and strategies in their operation, giving emphasis to the process of development with the aim to achieve a long lasting change. Information, knowledge, communication, and analytical skills are major tools in working with the people in order to learn together, analyze, and assess the situation with shared vision. The major aims are to strengthen their decision-making capability and, ultimately, empowerment the people.

It is easy to understand the role and function of the traditional relief and welfare-oriented NGOs. Materials, and services are given freely to people in need and suffering. The impacts are felt immediately. The role and function of development-oriented NGOs are more complex and the impacts take time to show.

A major expectation of development NGOs is **change** - a change in knowledge, idea, attitude, behaviour or practice for the better and, to be perfect, without negative impacts on other people and environment.

The different major functions carried out may include one or more of the following:

* the catalytic/facilitating role for better communication
* the intermediary role, with more active involvement in the issue
* the advocacy role, including monitoring
* the supplementary role, especially in leading new initiatives

On the basis of the experience gained and the lessons learned from NGO operation in Thailand, particularly during the past decade, development NGOs can effectively play the following roles in facilitating collaboration between government organizations/institutions and local communities/beneficiaries:

4.1 As a communicator, providing feedback information on the problems and needs of the grassroot people as a reflection to the government as well as presenting a different perspective, including gender-based, on the same development issues. The picture of rural children in a village eating clay publicized by the Children Foundation, for example, brought to the attention of the government the plight of many rural families . Such reflection and information feedback is desirable and very useful to the planners and decision-makers who deal mainly with the "average" data and information. The gradual strengthening of peoples' organizations (POs) and the increasing coordination and cooperation between the NGOs and the mass media as well as between the NGOs and the politicians (members of parliament) provide additional channels of communication. When-ever feasible, a more direct communication channel between NGOs and the government, ranging from informal dialogue to joint seminar to formal consultation, could help provide more effective solutions to many emerging social problems facing the country. As more networks are being formed and cross-fertilization of the various networks occurs, a much more effective communication and information flow from the various parts of the country where numerous small NGOs are operating would provide a better picture of the social condition of the grassroot people.

To be effective, NGOs need to maintain their independence and freedom to communicate and present the facts without bias.

4.2 Seeking For And Undertaking New Development Initiatives

Pilot projects and development models are necessary to test and develop new approaches and strategies for more effective development efforts by the government. This role can be operated separately or in cooperation with the government and/or the business sector. Projects in cooperation with and/or technically supported by the educational institutions are useful not only in gaining new knowledge but also serve as practical training ground for university students. Areas such as micro and small enterprises development, small-scale integrated farming and sustainable agriculture, community forests and local resource management, which need to take into consideration local environment and culture, offer new challenges to both GOs and NGOs. While cooperation with and support by government and donors are much needed and desirable, the NGOs need to have the flexibility and freedom to experiment and operate in response to the rapidly changing social and economic development trend but within the people's cultural norm.

Furthermore, as the country is emphasizing the role of science and technology in development and the subsequent promotion of national research and development, NGOs could, and should be encouraged, to play an important role in promoting the technology transfer to the rural areas and in assessing the appropriateness of the technologies to be promoted by the government. Pilot projects on technology transfer in the areas of energy conservation and biomass or wood-based energy development and utilization are some of the activities which are much needed and which NGOs could play a role. Others include new initiatives where women can be encouraged to participate in the mainstream development.

4.3 Providing Supplementary Services

As increasing number of welfare-oriented NGOs are shifting toward development orientation, their resources which come mainly from within the country could be mobilized to strengthen the government's development efforts, particularly in reaching out to special target groups and areas as well as in coping with increasingly occurring natural disasters in various parts of the country.

Furthermore, the seemingly increasing social responsibility on the part of the private business sector could lead to additional resources for social development efforts. Resources from the private sector include not only financial but also expertise in management and marketing. Recent initiatives by several profit making companies, such as the giant Charoen Phokephand agricultural business group in setting up a non-profit NGO-Charoen Phokephand Group Fund and its Youth Farmers Vocational Training Project and similar undertakings by others would certainly increase the number of NGOs with such supplementary services. Other companies opted to directly implement development projects in various village communities, either on their own or as part of the TBIRD Project (Thai Business Initiative in Rural Development) initiated by the Population and Community Development Association. The setting up of the Rural Capital Partners Company by a consortium of NGOs and financial institutions is another interesting example. Hopefully, these business-organized and supported NGOs could serve as a link between the business community/sector to the intellectual/ professionals-organized NGOs which are currently in the mainstream of NGO-operated development. Successful cross-cultural interaction and understanding between and among these NGOs would also help to facilitate the achievement of a balanced mix between the socio-cultural tradition and the new economic and industrial changing trend, acceptable to all.

NGOs need to be able to have access to the socio-economic data and information used by the GOs. A mechanism for information exchange between GOs and NGOs is, therefore, desirable. In addition, generous financial support from the government and the private business sector is essential and most appropriate in expanding such above-mentioned supplementary services by the NGOs.

4.4 Monitoring And Evaluation Of Major Development Policies And Programs

It is also desirable for NGOs, preferably in collaboration with the academic professionals, to monitor and assess the impacts of policies and programs initiated or promoted by the GOs and the business sector. Introduction of new tree species, large-scale commercial tree plantation, and relocation of communities, are some examples of the programs which may drastically affect people and their communities. The NGOs can help assess the outcome, then report, question or challenge the approaches and strategies adopted by the GOs and the businesses which hopefully would lead to review for change and improvement. Past examples included the non-selective promotion of eucalyptus plantation and the seemingly unlimited promotion of aquaculture farming in the coastal area communities.

4.5 Active Participation in Policy Formulation And Planning

Direct communication channels between the GOs and the NGOs are necessary to facilitate information exchange and better understanding leading to a constructive and timely solution to the problem or problems identified. Early and periodic dialogues with the government throughout the program/project development cycle are critical and desirable over the commonly practice of NGOs' participation only at the implementation stage. NGOs could provide an important inputs to the formulation of policy and the development plan, particularly in the areas where people will be largely affected. The participation must be timely and active. In the past, NGOs were given the opportunity to play a more passive role and at a much later stage in the planning process. As a result, it has not been possible to affect changes necessary. Within the past several years, specifically in relation to the preparation for the formulation of national development plans, NGOs have increasingly been encouraged to play a more active

role - participating in the formulation of the basic framework, and in the various working groups/subcommittees.

Other complementary roles of NGOs are in networking with other "actors" in national developments, including specifically members of parliament and academic professionals. Through such relationship there has been an information flow vertically linking the grassroot people through People's organizations (POs) and NGOs with universities and other academic institutions. NGOs and members of parliaments have a common interest in working with and for the people while NGOs and universities have a common interest in action-oriented research to test innovative development models.

Further more the working relationship between NGOs in developing countries and their counterpart - the international NGOs - should also be given increasing attention. This relationship varies greatly ranging from working on a joint projects to working entirely independent from each other. Most, if not all, international NGOs are normally required to register with the local (developing countries) government, mainly for the purpose of facilitating the immigration or custom procedures, such as a long-term permit of stay, duty privileges and tax clearance. Most international NGOs work to some degree with national development agencies and some serve as consultants on bilateral development assistance programs or projects.

Many international NGOs operate small grants program as part of, or in addition to, their regular program. Such funding intermediary approach allows small, non-registered NGOs access to funding from conventional donors who are normally required to work only with registered, established NGOs. It also provides an excellent opportunity for both local and international NGOs to better understand each other leading eventually to a more cordial relationship.

During the past decades, it may be stated that the relationship between international NGOs and local NGOs has gradually shifted from passive communication to active two-way communication and from provider - receiver relationship to that of partnership. Some organizations which began mainly as funding agencies have been increasingly and actively working with local NGOs in identifying problems and planning established NGOs. It also provides an excellent opportunity for both local and international NGOs to better understand each other leading eventually to a more cordial relationship.

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5. CONCLUSIONS AND RECOMMENDATIONS

The potential of NGOs in contributing to wood energy development can be fully realized only if all parties concerned make an effort to work towards the common goals for the benefit of the rural people. Following are major recommendations to government, donors and to the NGOs community.

5.1 To the Government

1. **A Clear Policy statement on the NGOs'** participation in national development is of prime importance. It is also necessary to **ensure that such policy on NGOs be translated into action at both the national and the local levels.** Participation should begin from the planning stage as well as at the implementation and evaluation stage.

2. **Familiarization of government officials on NGOs** is necessary to prepare the officials to deal with NGOs in a positive and constructive manner. A large number of government officials, especially at the middle and higher levels have had mixed experiences with development NGOs. It is, therefore, specifically recommended that an educational module on development NGOs be incorporated as part of curricula designed for regular training of government officials. For Thailand, the college for district officers is one such program as district officers are the key officials in the overall administration at the district level. These district officers are seen as crucial in influencing the attitude of other officials towards NGOs and, consequently, in effecting the relation of GO-NGO relations at the implementation level. Forestry and energy related institutes should be given special efforts to achieve necessary changes - initially in attitude and project delivery methodologies and eventually in institutional reform.

3. **Establishing a communication channel between GOs and NGOs,** particularly at the national level, is recommended to reduce the communication gap between the GOs and the NGOs. Past experiences showed that successful GO-NGO relations in most cases were based on personal relationship ad-hoc basis. As the turnover of officers is high among the NGOs and the rotation of government officials is frequent, it is desirable to establish a communication channel through which information exchange and regular contacts between the GOs and the NGOs can be efficiently and effectively made. All development and energy-related government-agencies should, at a minimum, establish, on an informal basis, an NGO "window" in the form of an NGO-oriented liaison officer. These include an agency responsible for coordinating with foreign technical assistance agencies/programs.

4. **Support to development-oriented NGOs.** There have been limited governmental support to the NGOs. If the government is serious in mobilizing the development NGOs in support of the government's efforts in national development, especially in reaching out to the grassroots, it is necessary for the government to make it a policy to support the NGOs. At present, development NGOs have been receiving financial and material support mainly from foreign sources. Governmental support is most appropriate in strengthening and facilitating the NGOs' work in providing services in support of or supplement to the government's efforts as well as in developing new initiatives through pilot projects. Other support services that are crucial to the expansion and growth of the NGOs include the simplification and relaxation in the rules and regulations, including tax measures concerning the NGOs. A simple one-stop service, as accorded to the private business sector and the relaxation on financial requirement upon registration are some of the initial steps that can be taken by the government to facilitate the GO-NGO relation and future cooperation. In the long term, legislation on non-profit corporations should be considered to facilitate the development of NGOs toward increasing financial autonomy in the future.

5.2 To the Donors

1. **Flexible funding mechanism.** As a large number of development NGOs are not registered as legal entities, they are mostly excluded as potential recipients. With the increasing emergence of non-governmental resource support organizations, it is recommended that alternative funding mechanisms be explored. Funding through such intermediary organizations could help extend the financial support to a larger number of NGOs, consequently reaching a wider NGOs and beneficiaries. More importantly, such approach would undoubtedly improve the gap between the NGOs and donors, resulting in better understanding and relations. As such, small grassroot level NGOs which are more effective in dealing with the grassroot people but weak in language proficiency and management will be more accessible to funding by international and foreign donors.

   It is also desirable to consider the introduction of planning grants to allow for more active collaboration between the NGOs and donors in developing projects. This will not only lead to more effective projects due to careful planning, but also to better understanding and attitude towards donors.

2. **Changing attitude and relations.** As many international NGOs(INGOs) combine the functions of funding with other development services, and as increasing number of donors are more actively participating in the project development and/or implementation, it is desirable that the relation be shifted toward that of partnership. Financial and technical resources from INGO donors are complemented by local resources on cultural experiences and local expertises. The complementary relationship serves as a strong foundation for successful cross-cultural interaction and, eventually, project outcome. Wherever possible, working in partnership is strongly recommended. Donors, therefore, are requested to take such recommendation into consideration in granting assistance to the INGOs working in developing countries.

5.3 To the NGOs

1. **The need to create awareness among all concerned on the role of development NGOs.** It may be stated that the role of development NGOs is not well understood and appreciated among the general public, within the government in general, the business sector and, probably, even within the diversified NGO community as a whole. The majority of people are more familiar with the traditional charity and welfare functions of NGOs. The roles of development NGOs in initiating new development models and strategies and, more recently, in advocacy for changes in policy and large development plans are relatively new and need to be explained to the general public. The general public's acceptance and recognition are crucial for the effectiveness and future funding of such NGO operation. Such public education is especially important in view of the increasing interest on the part of the business sector in shifting from the traditional support of charity and welfare services to the development-oriented services.

It is therefore desirable to promote the understanding to the effect that advocacy for change in policy and/or development plan is a major component of the NGOs' various activities and how it relates to other functions of the NGOs. The recent interest in environmental issues should facililate the better understanding and appreciation of the role of development NGOs.

2. **Strengthening the NGOs' capabilities and capacity.** In the past decade, the role and the impacts of the NGOs in development have been increasingly recognized. Such recognition has resulted in increasing demands on their capabilities, both in quantitative as well as qualitative terms. In addition to the need to closely monitor and, subsequently, adjust to the rapid social, economic and political changes within and outside the country, the NGOs have been facing increasing problems regarding funding and human resources.

   Voluntarism plays an important role in the success of NGOs' operation, ranging from the management and technical resource support services to implementation. As such, the commitment and the public interest of their operation are at the maximum and should not be questioned. While the NGOs feel the increasing need to become more professional in their work, it is felt desirable and important to maintain the balance between voluntarism and career professionalism. The supply of young, energetic, committed and well-trained volunteers and the funding through intermediary organizations are such examples. Increased mobilization of resources through networking - among the NGOs themselves and with the academic institutions and the mass media-are considered essential for the successful NGOs' operation. Coordination between and among the various networks and consortia, including the more established consortia within and outside the country is also desirable for information exchanges and experiences sharing.

3. **New challengers and new visions for the NGOs.** Developing countries in the region have been going through a drastically rapid change in various aspects during the past few decades. At the government level, free trade**,** in isolation from other social considerations, is promoted to the extent that the country and the people suffer as a result. The rapid flow of technologies into the country and the countryside without adequate preparation resulted in a series of damages ranging from many emerging health problems to disasters and deteriorating environment. The emphasis on and the expectation of the private business sector lead to the shifting from agriculture to industry and from small farming to commercial plantation. As a results, new elements and new demands are brought into the development scene.

   On the other hand, the NGOs traditionally working with farmers need to understand that even for the purely physical reason alone it will not be possible to keep all the farmers as farmers forever. There is a need to diversify in the way of life and in making a living. It is therefore necessary for the NGOs to be open to new possibilities and to continue looking for new initiatives to ensure enough choices for the farmers to choose. Integrated farming, community forest, and energy conservation, are only some of the many alternatives to be promoted. Micro enterprises, joint investment, and other benefit-sharing income-generating activities, including subcontracting are some of the other alternatives to be explored.

A well balanced approach is necessary to arrive at a well balanced solution. As such, the rights and privileges will have to be accompanied by the civic and social responsibilities. That principle must be observed by the government, the business sector and the non- profit NGO sector alike. As the NGOs question, challenge, and demand from the government, the business sector and, at times, from the people, the NGOs need to have a broader view and perspective on the issues concerned. New information, experiences and lessons learned are some of the effective tools that NGOs have to build up their credibility and clear visions in preparing for their work and in developing new strategies.

6. FINAL REMARKS

Intermediation between government institutions and program beneficiaries is only one component of a formula for more effective implementation of wood energy strategies. It is no doubt a major and very important component.

Other components, i.e. intermediation between the program beneficiaries and other key "actors", must also be understood and considered for inclusion as complementary components of the formula. These components include intermediation in relation to the academics, the mass media, members of parliament or politicians, and the private business sector. Additional components include religious institutions and donor (technical assistance agencies).

Non-governmental organizations' capacity is however limited in many ways especially in resources - financial, human and technology. There is also a limit to the growth and expansion of NGOs - normally at the expenses of effectiveness and social acceptability. Within and among NGO communities - national, regional and international - the combination of many or all of the various key components mentioned above are known as **networking** which is increasingly recognized as a powerful tool for affecting changes in a coordinated and consolidated manners.

If management strategies can be found to enable local people to participate, if NGOs, the media, and the business sector can be mobilized to become more actively involved, and if gender issues are identified early on in project planning, future wood energy development programs could break much new ground through shared concerns and compromising consensus.

7. CONSULTING REFERENCES

FAO, 1989. Women's Role in Forest Resource Management : A Reader, prepared by Brigitte van der Borg, FAO, Bangkok, Thailand.

Forum for Annual Reporting on Environment (FARE), 1992. Conservation of National Resources and Environment III, prepared by P.Nutalai,T.Panswadi and W. Sophonsakul-ratana, Bangkok, Thailand. (in Thai)

Ghee, L. T. and Valencia M.J. (ed) 1990. Conflict over National Resources in South-East Asia and the Pacific. United Nations University Press, Tokyo, Japan.

Korten, David C. (ed.) 1990. Getting to the 21st Century : Voluntary Action and the Global Agenda, Bookmark Inc., Manila, Philippines.

Ledesma, A.J. 1991. A Tree Grows in Village Asia. A Review, prepared for the Food and Agricultural Organization Regional Office For Asia and the Pacific, Bangkok, Thailand.

Poffenberger, Mark (ed.) 1992. Keepers of the Forest : Land Management Alternatives in Southeast Asia. Atenco de Manila University Press, Quezon City, Philippines.

Suwana-adth, Malee 1991. The NGO Sector in Thailand and the Potential Role of the NGOs in National Development, SVITA Foundation, Bangkok, Thailand.

Taylor, David A. (ed.) 1992. NGOs and Tree-Growing Programs : Working between Farmers and Governments.Report of an International Workshop, September 1991, Pune, India, Winrock International Institute for Agricultural Development.

World Resources Institute, 1992. World Resources 1992 - 1993. Oxford University Press, London, England.

DECENTRALIZATION OF INSTITUTIONAL RESPONSIBILITIES FOR WOOD ENERGY DEVELOPMENT

Socrates-Apollo P. Botictic[1]

1. INTRODUCTION

The second phase of the project on Regional Wood Energy Development Programme in Asia seeks to formulate and follow an integrated approach for the development of wood energy production, processing, trade and use. Emphases have been focused on various strategies particularly on:

* Identification of needs, opportunities and priorities for wood energy development
* Improvements in the production of woodfuels
* Improvements in the distribution and conversion of woodfuels
* Support to coordination between agencies and institutions involved in planning and implementation
* Strengthening of network for sustained regional cooperation through promotion of TCDC and improved inter-agency coordination and collaboration with national and regional networks

These are important strategies to consider for wood energy development activities and from the standpoint of a national policy planning agency, another important consideration needs to be emphasized. This is linked to the fourth item of the afore-mentioned strategies but which is more focused towards the decentralization of institutional functions for a more direct and effective interaction between local energy planners and wood energy users.

Woodfuel energy management for the Philippine situation particularly is starting to depend on a more decentralized approach in making energy planning in general and fuelwood energy management in particular more responsive to the needs of the majority of the rural people.

This effort is being attempted by utilizing the Department of Energy's Affiliated Non-conventional Energy Centers or ANECs which are academic institutions distributed across the country's various regions, in the process of rural energy planning. These ANECs have been in existence for an average of three to five years and at this time, they have already developed linkages among the different role players in the renewable energy industry in the rural areas such that they are being tapped as the principal conduits in the dispersion of fuelwood management activities.

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However, before the implementation of this decentralized approach can be fully effected, some major concerns have to be considered. These concerns are:

* First, the importance of wood energy must be promoted and widely disseminated such that this particular sector is not anymore 'ignored' and more importantly, awareness is accepted and inculcated in all sectors including government policy-makers as well as external financing institutions.

* Second, there must be one specific agency or entity that must be responsible for the overall supervision and coordination of programs and/or projects on fuelwood.

* Third, there must be clear policies linking indigenous energy requirements vis-a-vis management and development of energy resources particularly fuelwood

* Fourth, there must be adequate and reliable database to work on in order to achieve a credible fuelwood energy development plan

2. THE IMPORTANCE OF WOOD ENERGY

The sustainability in the supply of fuelwood can not be over-emphasized in that it has been the thrust of an international body such as the FAO-RWEDP. From the 1989 Project Advisory Committee Meeting held in Bangkok, Thailand, it was noted that "...For millions of people in the developing countries, woodfuels are by far the only source of daily energy supplies. Unfortunately, the basic energy source is depleting very fast, thus not only affecting the daily lives of millions of underprivileged men, women and children, mostly rural, but also the environment, the very basis for their subsistence."

From a study commissioned by the Department of Environment and Natural Resources (DENR) entitled "A Study Towards the Formulation of a National Fuelwood Policy (1992)," some of the observations regarding fuelwood considerations on the economy and the clientele in the Philippine setting, are as follows:

* Fuelwood remains to be the major alternative to imported energy accounting for 34% of the total energy consumption of the country

* Fuelwood and charcoal trading are important sources of income for rural households. About 600,000 or 10% of all rural households are dependent on fuelwood trading as a means of livelihood. Urban fuel markets provide an average of 40% of the total cash income of these households

* Majority of the households are dependent on fuelwood as a principal energy source. Roughly 66% of the country's households utilize fuelwood for cooking and ironing requirements

* Low income households are the main users of fuelwood. An estimated 46% of fuelwood users lie within the poverty threshold

* Many industries are highly dependent on fuelwood as an alternative energy source. Industrial users account for 29% of total fuelwood demand

These observations highlight the importance of fuelwood in the daily activities of our society mainly by our rural households and to some extent, by selected industries. However, it is important to stress that this so-called important energy source is, to understate it, being largely ignored.

Energy planning agencies, not only in the Philippines but in many other countries as well, do not seem to consider the huge contribution from wood and charcoal products to the total energy mix and consequently to the economy. It appears that only the agriwastes (e.g. bagasse) consumed for industrial furnaces and boilers are included in the national energy statistics. Agencies that are involved in fuelwood issues therefore must come into agreement and make a unified position regarding fuelwood considerations and its significant contributions to the economy.

3. INSTITUTIONS INVOLVED IN WOOD ENERGY DEVELOPMENT

There are at least three key agencies or institutions in the Philippines which have varying mandates related to fuelwood management. These agencies, which compose an ad-hoc Technical Experts Group (TEG) to deliberate on fuelwood issues, are:

3.1. Office of Energy Affairs - Non-Conventional Resources Division (NCRD) recently transformed into the Department of Energy - Non-Conventional Energy Division (DOE-NCED)

This is the government agency mandated to formulate and direct the comprehensive Non-Conventional Energy Program (NCEP) which aims to increase the contribution of non-conventional energy resources to the national energy mix. The NCEP is incorporated into the National Energy Plan of the DOE, prepared by DOE's Planning Bureau. The inter-agency TEG is currently pushing for the Energy Department to take on the role of a central agency in the promotion and coordination of efforts for the use of fuelwood and other biomass materials vis-a-vis other energy sources. Priority areas for woodfuel intervention will be identified. The development of a common package for research, training, extension and promotion activities will be undertaken. The Affiliated Non-Conventional Energy Centers (ANECs) of DOE-NCED are being tapped to be the lead agencies for energy planning, direct involvement for projects concerned with biomass energy technologies as well as woodfuel research and training at the regional level.

3.2. Department of Environment and Natural Resources (DENR)

This is the government agency concerned with the conversion, management, development and promotion of the proper use of the country's environment and natural resources. Its Forest Management Bureau (FMB) is responsible for managing forest lands including those in reservation and watershed areas, and lands of public domain. In this regard, DENR is the agency responsible for ensuring

the sustainable supply of fuelwood resources. FMB currently heads the TEG formed in the DENR under the FAO-RWEDP, but as this is an ad-hoc entity, there is therefore no assurance whether the programs undertaken will be sustained.

3.3. Department of Science and Technology (DOST)

This agency is primarily tasked to provide the central direction, leadership and coordination of scientific and technological efforts in the country. There are two institutions within DOST which are tasked to undertake wood energy activities. On one hand, the Industrial Technology Development Institute is responsible for research and development in the fields of industrial manufacturing, mineral processing and energy. On the other hand, the Forest Products Research and Development Institute is responsible for conducting applied research and development in secondary and tertiary processing of forest products.

Some observations indicate that majority of fuelwood resources are gathered outside forest lands and in this regard, there is a need to involve the Departments of Agriculture (DA) and Agrarian Reform (DAR) in the management of fuelwood resources in the alienable and disposable lands.

In this context, the Philippine situation is such that there is no specific entity that is directly responsible for the supervision and coordination of fuelwood-related programs and projects. This will therefore hamper the effective carrying out of woodfuel planning objectives as the implementors would either undertake a duplicity of functions or in the other extreme case, not be able to do anything about an important responsibility.

4. PRESENT POLICY ISSUES

Currently, the policies affecting wood energy management in the country are embedded in at least three different instruments, namely: The National Energy Plan (NEP), the Master Plan for Forestry Development (MPFD) and the Philippine Strategy for Sustainable Development (PSSD).

4.1 The National Energy Plan - seeks to attain the following objectives:

1. Ensure the availability of energy to the markets in the country at reasonable prices
2. Promote the judicious and efficient use of energy resources; and
3. Accomplish objectives 1 and 2 with minimal adverse effects on the environment

In consonance with these objectives, the specific energy policies of the government include:

1. Promotion of energy self-reliance
2. Rationalization of energy prices to reflect the true costs of production and distribution

3. Encouragement of energy conservation measures to promote efficiency
4. Participation of private sector in energy projects; and
5. Maintenance of environmental and safety measures for energy projects

One important component of the National Energy Program is the Non-Conventional Energy Program (NCEP) which was formulated to develop and promote the utilization of non-conventional energy systems which are technically feasible, economically viable and socially desirable and which have vast commercialization potentials to substitute for conventional energy systems. The NCEP has three sub-programs created to fulfill its objectives:

1. The Technology Development Sub-Program - which aims to further improve the techno-economic efficiency of non-conventional energy systems (NES)
2. The Promotion and Commercialization Sub-Program - which aims to create a favorable market environment for the non-conventional energy industry and to increase awareness of its potential
3. The Affiliated Non-conventional Energy Center (ANEC) Sub-Program - which aims to establish a mechanism by which the use of non-conventional energy systems is promoted in rural and remote areas. It is through the ANECs that a possible conduit shall be effected towards the decentralization of tasks on fuelwood programs/projects.

4.2. The Master Plan for Forestry Development - has been formulated due to the heightened concern for the sustainability of the country's natural resources and the massive forest destruction and environmental degradation experienced during the past years. Its objectives are:

1. Meet the needs for wood and other forest products by placing all of the country's production forest under sustainable management
2. Contribute to the production of food, water, energy, and other needed commodities by properly managing the upland watersheds
3. Protection of the land and its resources against degradation and ecological devastation through proper land management systems and practices
4. Conservation of the forest ecosystems and their diverse genetic resources
5. Contribute to employment and growth of national and local economies through fully-developed forest-based industries
6. Promotion of social justice and the recognition of the rights of indigenous cultural communities in the management, conservation and utilization of forest resources

The MPFD has identified a set of sub-programs (Please see Annex A) directed towards making forest occupants partners in forest conservation; aims to achieve equitable access to forest resources and encourage private sector participation in forest development. These programs entails giving rights to forest occupants or communities to utilize forest resources with the corresponding obligation to conserve and reforest the area concerned. Contracts are for 25 years renewable for the same period.

Other legislative action which have direct relevance of forest resource development have likewise been made. The Local Government Code, for instance, provides for the involvement of local government units in the issuance of forest permits and imposition of forest charges thereby giving it direct impact on fuelwood policy.

A total logging ban is also under scrutiny in the two chambers of Congress but a resolution of two conflicting versions has not yet been effected.

4.3 The Philippine Strategy for Sustainable Development - seeks to achieve economic growth with adequate protection of the country's biological resources and its diversity, vital ecosystem functions and over-all environmental quality. Its objectives include:

1. Ensure the sustainable utilization of the country's natural resources
2. Promote social and intergenerational equity in the utilization of the country's natural resources
3. Develop management programs to preserve the country's heritage of biological diversity
4. Promote the technologies of sustainable lowland agriculture and upland agroforestry through the encouragement of research and development and demonstration projects.

There is a set of core implementing strategies formulated by the PSSD which is directed towards resolving various issues arising from the country's development efforts:

1. Integration of environmental considerations in decision making
2. Proper pricing of natural resources
3. Property rights reform
4. Establishment of an integrated protected areas system
5. Rehabilitation of degraded ecosystems
6. Inducing growth in rural areas
7. Promotion of environmental education
8. Strengthening of citizen's participation

In summary, there are already numerous existing government policies related to fuelwood issues but these are either subsumed in more general terms under the NEP, the MPFD or the PSSD, thus diluting their thrusts and intended impacts.

In order to implement an effective fuelwood energy development program, the government needs a set of clear-cut policies focusing on the relevant aspects of fuelwood development and management. This set of policy recommendations must contain considerations leading to the attainment of our objectives, including peripheral methodologies and other influencing factors that will ensure a project's quicker accomplishments.

5. POLICY RECOMMENDATIONS

Policy recommendations from this country's standpoint must be able to sustain and expand the use of fuelwood energy resources in a method which upholds the basic principles and objectives of the National Energy Program, the Master Plan for Forestry Development and the Philippine Strategy for Sustainable Development. Furthermore, it must likewise adhere to the basic tenets of FAO-RWEDP's program so that regional cooperation and collaboration shall be effected.

From DENR's study, a development plan is recommended which addresses the following objectives:

- To ensure the sustainable supply of cheap fuelwood for low income population
- To promote and ensure the judicious, optimum and efficient use of fuelwood resources
- To sustain, and expand, where possible, the use of fuelwood by the industrial sector.

Policies on the development and management of the fuelwood sector shall center on the following:

- Priority for ensuring the supply of firewood particularly in areas with low secondary biomass resource available
- Promotion for the use of secondary biomass materials in areas where these are abundant and underutilized
- Promotion of the use of improved cookstoves particularly in urban areas
- Implementation of stronger conservation policies and effective enforcement mechanisms that would prevent over-cutting or encroachment on environmentally-sensitive areas

Policy options on various issues are recommended by the DENR study The issues are:

1) On land use management;
2) On fuelwood plantation establishment;
3) On family woodlot establishment/ Massive tree planting program;
4) On inter-provincial resource transfer;
5) On charcoal production;
6) On the promotion of improved cookstove technologies;
7) On fuelwood substitution;

Other measures are likewise recommended in support of the afore-mentioned options, and these include:

* Strengthening the coordination among the DA, DENR, DOE, DAR, the Academe, LGUs and NGOs.
* Database improvement
* Information and education campaigns
* Expansion and strengthening of the extension and enforcement arm of the DENR as well as the deployment of these personnel in priority areas

* Decentralization of most fuelwood management tasks utilizing the Department of Energy's Affiliated Noncon Energy Centers situated in the regions

If the government wants to make substantial achievements in covering the various issues, then it must first focus its attention towards the strengthening of the support measures. The matter concerning strengthening the coordination among government institutions is already being effected at present. There is currently a committee working on an "Integrated Approach to Energy Planning for Sustainable Rural Development," composed of representatives from the National Economic and Development Authority, OEA, National Power Corporation, National Electrification Administration, the Departments of Agriculture, Science & Technology, Transportation & Communication, Interior & Local Government, ANECs and LGUs.

The main objective of this inter-agency committee is "to formulate an energy plan that should be within a framework which ensures the confluence of national energy policies with interest of the smallest rural communities and the establishment of effective mechanisms to convert rural energy plans into implementable projects."

Efforts on database improvement are likewise being facilitated through various fuelwood surveys undertaken for the Philippines. Some of our national database information includes results from an Urban/Rural Household Energy Demand Survey (1977); Ministry of Energy's Rural Energy Needs Survey (1982) and Office of Energy Affairs' Household Energy Consumption Survey (1989); Fuelwood Traders Survey (1990). The Fuelwood Traders

Survey however has been undertaken only for a selected number of provinces which were selected on the basis of an ANEC presence in the area. In order to capture the national pulse, a more comprehensive data gathering should be undertaken for this purpose.

Information and education campaigns are also necessary in order to reach out to the target beneficiaries in as wide a geographical areas as possible. DENR may also be providing additional personnel complement to strengthen its extension and enforcement arm in the regional offices to concentrate on priority stress areas.

And finally, the decentralization of fuelwood management tasks will be pursued by the Department of Energy through its Affiliated Noncon Energy Centers.

6. THE AFFILIATED NONCON ENERGY CENTERS

The Affiliated Noncon Energy Centers (ANECs) are colleges and universities located in various regions of the country tapped by the Department of Energy's Non-Conventional Energy Division as its partners that will undertake rural energy planning activities in behalf of the DOE-NCED. These activities include:

1. Introduce, transfer and encourage the utilization of technically and economically feasible non-conventional energy technologies in the rural areas
2. Formulate Regional Energy Plans (REP) for integration into the Non-Conventional Energy Program and National Energy Plan of the Department of Energy

3. Conduct techno-economic feasibility studies for energy technologies appropriate in the area
4. Design and installation of non-conventional energy demonstration units
5. Undertake non-conventional energy technology promotion and information dissemination
6. Conduct seminars/trainings on renewable energy to local residents
7. Provide maintenance and repair service on renewable energy technology users
8. Monitor extent of utilization of noncon energy in the region

A typical Affiliated Noncon Energy Center Project is composed of part-time faculty staff who will man the positions of Project Director/Leader and Heads of three Divisions: i) Technology Development; ii) Extension and iii) Survey. Full-time personnel are also employed to run the Center's operations on a year-round basis. Contractual staff are occasionally hired to undertake specialized activities such as the conduct of survey activities as requested by DOE-NCED.

All of these institutions have an engineering orientation and a good number of them are agriculture-based. Started in the mid-1980s, there are currently fifteen ANECs distributed in eleven regions of the country. These ANECs are listed down in Table 1 (See also Annex B for geographical location).

Table 1
The Affiliated Non-Conventional Energy Centers of the Department of Energy
Non-Conventional Energy Division

Region	Affiliated Non-Conventional Energy Center	Status
I	Mariano Marcos State University	State
I	Benguet State University	State
I	Don Mariano Marcos Memorial State University	State
II	Isabela State University	State
III	Central Luzon State University	State
IV	Don Severino Agricultural College	State
V	Camarines Sur State Agricultural College	State
VI	Central Philippine University	Private
VII	University of San Carlos	Private
VII	Silliman University	Private
VIII	Visayas State College of Agriculture	State
IX	Western Mindanao State University	State
X	Xavier University	Private
X	Central Mindanao University	State
XII	Mindanao State University	State

Only the National Capital Region and Region 11 remain to be ANEC-less areas at present. Eleven out of the fifteen Centers are state or government colleges or universities while the rest are private/ sectarian. DOE-NCED plans to add five more ANECs in 1993 including a sub-ANEC for Regions 3 and 5. A sub-ANEC would mean that the processes to make such an institution become an ANEC, originated from a present Center and not from NCED itself. This unprecedented situation is being realized in Region III particularly Central Luzon State University which has

initiated talks in utilizing Tarlac College of Agriculture to be the former's sub-ANEC and Region V (CSSAC) which will annex Bicol University (BU) as a sub-ANEC especially since BU's College of Agriculture is deeply involved in fuelwood programs and activities.

The Department of Energy provides funding to its affiliated centers annually but due to severe budget cuts in the recent past, financial assistance has dwindled down from a level of around ₱500,000 ($20,000) for each ANEC in the late 1980s to only about ₱100,000 ($4,000) or even less per Center in the immediate past year. Presently however, with the transition from the Office of Energy Affairs to the new Energy Department and with the renewed focus which the energy sector is being given, it is expected that funding levels for each Center may reach as much as ₱600,000 ($24,000) for one year operation only.

Aside from Bicol University, other ANECs, one of which is represented in this seminar, are heavily involved in fuelwood supply and demand studies. The University of San Carlos - Area Research Training Center, for instance, has been engaged in woodfuel survey activities with assistance from sources other than the Philippine government.

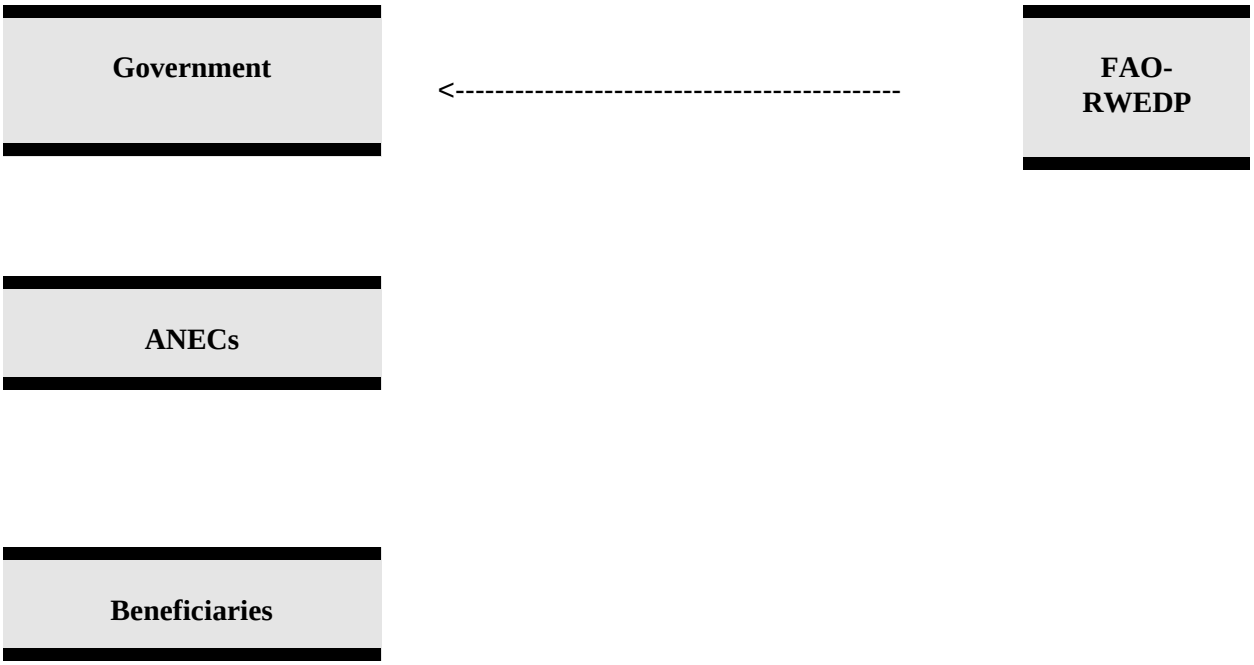
DOE-NCED is proud of the achievements of such Centers which are able to link-up with international institutions including FAO-RWEDP, in the pursuit of activities relevant to its objectives. Another ANEC, the Mariano Marcos State University from the Northern Luzon group, is also into the study of improved cookstove technologies, a vital area in efficient fuelwood management strategies.

To equip the ANEC personnel with the necessary skills related to energy planning and even non-conventional energy technology design and installation, various short courses/workshops are prepared and conducted by the DOE-NCED and participated in by ANEC representatives. Local and even international seminars/trainings on technical aspects as well as economic/financial issues are prepared for ANEC staff who have now 'graduated' as experts in the renewable energy field. At times, DOE-NCED recommends the nomination of ANEC staff for foreign training in lieu of regular DOE personnel.

7. ESTABLISHING THE FLOW: A CONCLUSION

The Affiliated Non-conventional Energy Centers are existing because they have been established for the purpose of disseminating information on alternative energy technologies as well as for formulating energy plans in their regions. These Centers, being in direct contact with wood energy end-users, can be utilized as effective conduits of the government's fuelwood development and management programs and activities.

A possible program flow, which is proposed to be institutionalized, must therefore include an additional conduit between the government agency and the user in the form of the ANEC:



With catalytic support from the FAO-RWEDP, this innovation can be pursued in the Philippines as the linkage has already been initiated. The government institution/s shall be represented either by the Department of Energy or a strengthening of the existing Technical Experts Group currently chaired by DENR's Forest Management Bureau.

With sufficient technical as well as financial assistance, the Affiliated Non-Conventional Energy Centers will be able to implement additional activities such as:

* Wood energy resource flows assessment and natural resource monitoring
* Improvements in woodfuel production sustainability as well as in its conversion and distribution
* Develop an energy resource model and conduct wood energy planning using this method
* Evaluation of forestry extension strategies/methods
* Conduct training activities and information dissemination on links between wood energy and agro-forestry; and about new trends and ideas/experiences on woodfuel developments
* Extend information dissemination through their own institutions for the benefit of the student population (introduce 'green' projects such as tree planting activities)
* Establish linkages between local entities, including the media, involved in woodfuel activities
* Preparation of manuals on wood energy conversion and forestry extension

Larger scale awareness of woodfuel management in the rural areas will only be effective if there is an effort to bring these programs and projects closer to the beneficiaries. The Affiliated Non-conventional Energy Center should serve as the extension network that would deliver the

technologies to the grassroots level with a firm commitment. The advantage would be that these ANEC people speak the language of the user, have a heightened sensitivity of their own culture, and they would have a certain bond that would ensure the acceptance of what the ANEC people is bringing.

A greater effort should be made by the government's central institutions to develop and strengthen these ANECs as they are the unnoticed catalysts in determining a success or a failure of an energy development program in the remote areas. International agencies such as the Food and Agricultural Organization - Regional Wood Energy Development Program must likewise realize that organizations such as the ANECs can be helpful in disseminating their programs and contributing to their thrusts and objectives which they have intended to fulfill in the region.

ANNEX A

1. Integrated Social Forestry Program (ISF) - where forest occupants are given rights to landholdings with a maximum of 7 hectares of forest land. DENR Administrative Order No. 28, series of 1989 mandates participants to develop at least 20% of their land to tree farming

2. Community Forest Programs - for communities where the range envisioned is up to 1,000 has., 1,000-5,000 has. and larger than 5,000 has. for small, medium and large holders, respectively.

3. Contract Reforestation with the Forest Land Management Agreement (FLMA) - where the upland families, communities and corporations are contracted to carry out the protection, maintenance and management of forest plantations after these have been turned over to the government.

4. Integrated Protected Area System (IPAS) and Bio-Diversity Conservation Program - which seeks to establish a protected area system that is representative of major bio-units and ecosystems.

5. Establishment of permanent forest estates and enhancing the productivity of the forest resources

6. Establishment of forest plantations and tree farms - Under A.O. No. 97, series of 1988, participants are encouraged to develop agro-forest farms in coordination with the National Forestation Program which aims to reforest some 1.4 million hectares up to the year 2000 of which 31% is earmarked for fuelwood plantations.

7. The Product Development Programs - focus on the development and rehabilitation of wood-based industries.

8. The Institutional Development Programs - serve as support mechanisms with activities on development of the policy and legal framework; research and development; extension; education and communication.

9. Other regulations affecting fuelwood resources include:

    a. DENR Administrative Order No. 24, series of 1991 - which prohibits logging in old growth forests beginning 1992

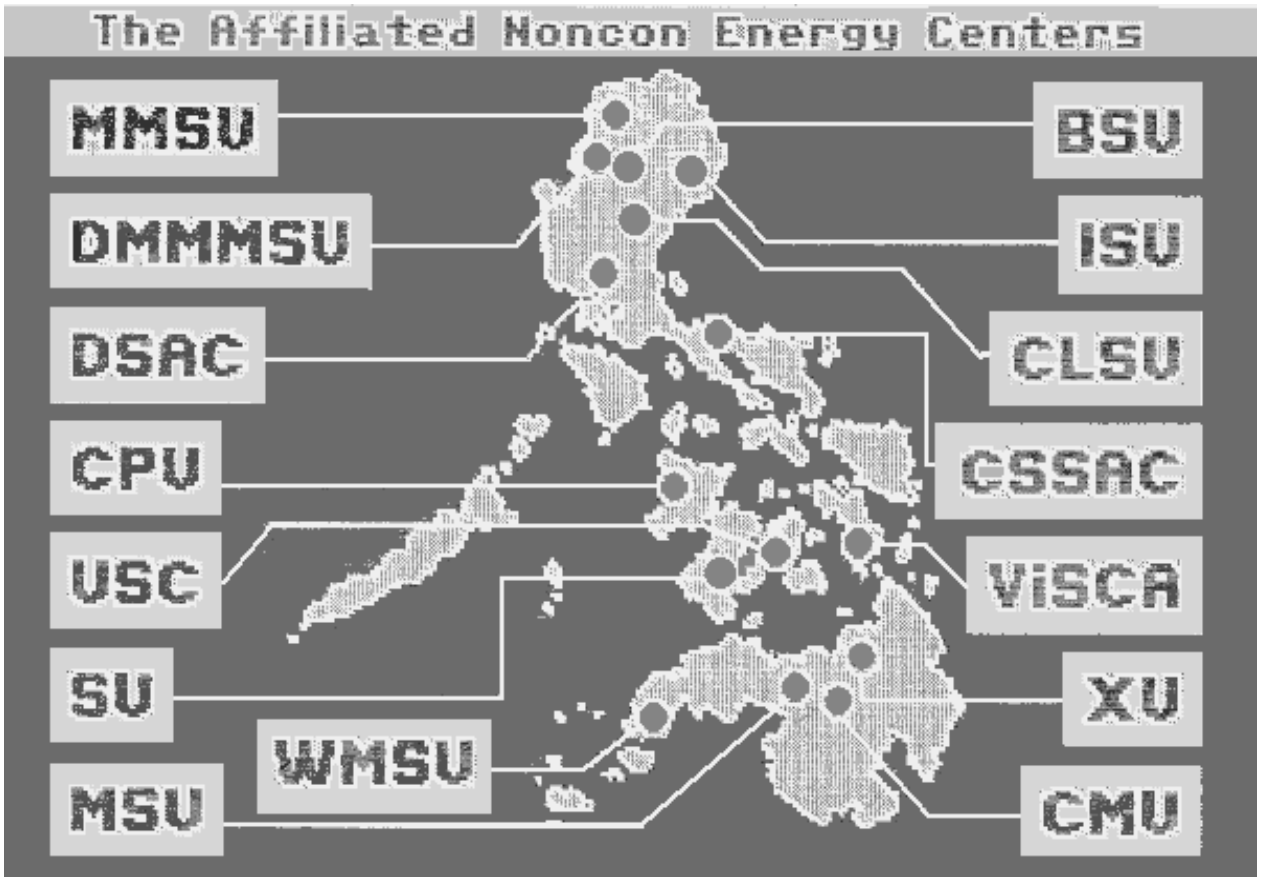
    b. DENR Administrative Order No. 27, series of 1989 - which bans the exportation of fuelwood to assist the local enterprises using wood as energy source

    c. DENR Memorandum Circular No. 19, series of 1989 - which prescribes additional guidelines on Timber Stand Improvement in dipterocarp forests, the products of which may be used for fuelwood

    d. DENR Administrative Orders No. 26 and 79, series of 1990 - which deregulates tree harvesting, transporting and the sale of firewood, pulpwood and timber planted in private lands.

ANNEX B

Philippine Map Showing Locations of Affiliated Noncon Energy Centers



Inter-Sectoral Linkages Towards Integrated Planning and Programme Implementation

by

Binayak Bhadra[1]

1. INTRODUCTION

In the present context of the popularity of economic liberalization, increasingly, the role of the governments are perceived to be different than that of carrying out the centralized planning and development activities by itself. It is notable that the governments are now expressedly seeking to enhance the participation of the local population in development through local community organizations and greater emphasis fallen on the involvement of private sectors and non-governmental organizations. The overall policy environments are significantly different from those of the past, and therefore this has many implications towards institutional policies. The major shifts in institutional policies emanate from the acceptance of the need to move rapidly towards deregulation and decentralization.

The decentralization of planning process and its implementation are a pre-requisite to decentralized energy planning. The foremost institutional policy thus consists of creating the appropriate institutional capability to carry out decentralized planning. This may require acts and regulations for decentralization to be operationalised. Such judicial, legal and regulatory framework are often a necessary condition for the success of the decentralization process, although experience shows that they by themselves are usually not sufficient conditions.

For example, in Nepal, District Development Committees (DDCs) have been recently setup, which consists of locally elected politicians, and it is empowered by the Constitution of the country to be the bonafide unit of local governance, with clearly specified rights and responsibilities. The decentralization act provides for the judicial and legal framework for the establishment and operation of the local government, with specifications on its planning, resource mobilization and evaluating functions.

The DDC's are however unable to carry out their district level planning functions, as they lack the experience and the knowledge to carry them out. The institutionalization of the planning functions and processes will require, amongst other things, training of the newly elected polity and the provision of the adequate administrative apparatus. The implications is that, resource requirements, both financial and technical manpower, are initially high. The establishment of decentralized planning process however means that the decision making and resource generation authorities are transferred to the local level, which makes it possible to enhance the local resources mobilization and their effectiveness in development process. Peoples' participation in development activities are also expected to flourish as accountability and transparency will be achieved in them.

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[1] National Planning Commission, His Majesty's Government Nepal.

2. RURAL ENERGY PLANNING FUNCTIONS AND INSTITUTIONALIZATION

Integrated energy plans which are formulated within the constraints of natural resource endowments, available energy technologies and related institutions represent the culmination of a process of matching energy needs with energy supplies. As has been described elsewhere by Codoni, Park and Ramani (1985), such energy supply-demand balance essentially represents a compromise between energy demand projections (based upon the scenarios of economic progress and population growth) and energy resource assessments and technology evaluations.

In an ideal case, the integrated planning process has its own dynamics, where the energy imbalances are reviewed and the related policies and their impacts are continuously monitored and the corrective policies and actions undertaken. In this context, the energy planning institutions are essential, at the national and the local levels. They are necessary for assessment of the future evolution of energy demand, supply, and their imbalances. Furthermore, both at the local and national levels, supply-demand balancing exercise remain essentially incomplete as a planning exercise, without the assessment of the economic implications, particularly those related to growth, equity and the export performance.

Apart from the more conventional and directly related areas of demand/supply assessments and projections, the functions of the energy planning institutions have therefore tended to grow into the following areas:

(a) financial (and other) resource mobilization for energy sector development,
(b) formulation of energy projects and programmes, and
(c) evaluations of socio-economic and environmental impacts of energy sector activities.

The discussion of the policies for the initiation or strengthening of energy planning institutions, both at the local and national levels, may therefore be carried out through a analysis of the roles of these institutions in the following areas of energy planning activities:

(i) Energy Supply-Demand Analysis and Balancing
(ii) Resource Mobilization (Financial, Natural and Human)
(iii) Assessment of Socio-economic and Environmental Impacts
(iv) Energy Supply-Demand Management
(v) Monitoring and Evaluation of the Project and Programme Implementation

3. INSTITUTIONAL POLICIES FOR DECENTRALIZED ENERGY PLANNING

Integrated energy planning requires that, energy demand and supply analysis be carried out at various levels of aggregation, ranging between the macro (national) and micro (the village level). The supply and demand analysis examines factors and variables that directly or indirectly influence the demand or supply of energy, and therefore provides the genesis of integration in policy and plan formulation in the energy sector at all levels.

It is to be noted that, wood-energy planning, specifically the wood demand and supply assessments, must be made an integral part of the integrated rural energy planning process. The decentralization of rural energy planning and implementation activities demands that

requisite local level energy planning institutions be created. This presumes that decentralized planning processes and institutions are already existent or are in the process of being created.

Energy demand analysis examines the economic factors, such as, prices, costs and tax/subsidy, which directly influence energy usage pattern and the resultant demand. Socio-cultural factors, such as, cultural norms and social preference and rituals, also have a significant influence on the nature and quantity of energy required and demanded in rural economies.

Physical factors, such as climate and topography also influences demand phenomena for energy. Perhaps, most importantly, the changing demography, both through population growth and migrations, result in the most rapid changes in quantity and mix of energy. These are perhaps the most compelling reasons for undertaking decentralized energy planning, the specific conditions demand specifically tailored interventions and innovations.

The approaches taken in demand assessments, may vary from the more simplistic to the more sophisticated rural energy demand models. For example, the energy flow models based on human ecology principles (Dazhong and Pimentel, 1984 and Baker, 1979) have been utilized to analyse the existing and future patterns of rural energy use. Various simulation models applied for the Andes are also described by Baker (1979).

Such models concentrate upon the biological /ecological relationship of energy use, (for example, in case of simulation models of Blankenship-Thomas and McRae for Andes described by Baker) and are not appropriate for economic analysis, although they are quite effective in the analysis of ecological implications and environmental impacts. The decentralized institutions, at the local levels may not need capabilities to deal with such rigorous and sophisticated models, but the results from such complex models should also be available to them.

Energy demand projections into the future thus requires a cognitive analysis of many influencing variables in quantitative as well as qualitative terms. It is worthwhile to note that, very often, the more significant changes in energy mix and energy quanta result from the ongoing changes in the structure of economic activities undertaken within the rural economy. This poses a challenge in energy demand forecasting in two distinct senses.

Firstly, the momentum of ongoing economic development in rural areas often represent changes in economic activities and associated energy usage. That is, there are new production processes being undertaken in addition to the traditional production processes and there are other old production processes which are being completely abandoned or modified. These have their implications towards energy mix used and the intensities associated with them. Similarly there are energy use changes associated with changing patterns of consumption processes.

Secondly, the very provision or alteration of energy inputs can greatly influence the pace and nature of new economic activities under-taken. This in turn, may have a significant second, third, and fourth round effects on the mix and quanta of energy demanded. The more appropriate the energy provision/plan for rural development, the more dynamic the secondary and tertiary energy use impacts.

In this sense, energy demand forecasting consists of a process which examines existing and induced energy requirements of production and consumption processes in a re-iterative fashion so as to capture all of the primary, secondary and tertiary impacts. The dynamic

complexities may be more readily manageable in conceptual terms at the micro-level, enhancing the attractiveness of decentralized energy planning approaches.

It should noted that, at the micro-level, the potential primary, secondary and tertiary impacts of energy development are relatively easy to identify and measure. At higher aggregation levels, the identification and measurement problems associated with secondary and tertiary impacts expand rapidly. This is so on account of increased diversity in types of economic production and consumption processes found within large geographic areas. This is another reason for decentralization of rural energy planning activities.

Similar conclusions can be arrived at for rural energy supply analysis. Rural energy supply analysis involves primarily the examination of natural resource base, particularly the availability of, farm biomass, forest biomass, micro-hydro, wind, solar and animal energy resources. The rural energy supply from these energy resources are influenced by economic factors, such as, prices, costs, taxes/subsidies associated with them.

The other important factor consists of the energy conversion and end-use technologies presently or potentially available. The degree of impacts of these economic and technical factors on rural energy supply depends to a large extent on the degree of commercialization and accessibility of the rural areas. Thus supply analysis needs to be institutionalised to be able to regularly monitor changes in these factors. Similarly, the other energy planning activities that needs to be institutionalized at the local level are as follows: energy balancing, resource mobilization (financial, natural and human), assessment of socio-economic and environmental impacts, energy supply-demand management, monitoring and evaluation of the project and programme implementation.

At present, local level capabilities in rural energy planning, are far short of the need. This is primarily due to the fact that the local level planning is also week. It is thus, necessary to create and / or strengthen local level energy planning institutions so that they are able to analyse the dynamics of energy demand and supply, and assess the impacts of various energy initiatives that may be locally viable. The central energy planning institutions themselves are however not well funded, and thus may find it difficult to extend themselves to the local level directly. Under such circumstances, it becomes important to draw both non-governmental organizations and private sector into local energy planning activities, by divulging some of the rural energy sectors to them. It is also important to find enabling mechanisms, whereby local resources may be brought to bear upon the local energy planning activities.

4. COMPLIMENTARY INSTITUTIONAL POLICIES IN NON-ENERGY SECTORS

It is to be noted that, often, there are great hurdles for economic signals (such as, prices and costs) to operate in a rural setting, particularly in the context of the public property nature of energy resources such as, small hydro power sites, community owned forests and pastures etc.

The non-commercial nature of biomass and water energies (such as, fuelwood collected from community forests) often imply that the private and public benefits/costs associated with them are widely divorced from one another.

There is often a "tragedy of the commons" situation prevailing in the absence of a clearly defined property or use rights for these energy resources. The implications are that, the individuals behave in such a way as to internalize the benefit from these energy resources and to externalism the costs associated with them. Under such circumstances it becomes difficult for better technologies (such as improved fuelwood trees and improved stoves) to get adopted in the rural areas. There are serious implications of this towards energy demand-supply management.

Thus there are institutional factors, such as, ill defined property rights, which influence the adoption of available energy technologies. The absence of appropriate institutions for technology diffusion also hinders the dissemination of suitable and beneficial energy technologies. To take another example, let us consider small hydro-power energy abundant in many mountain areas. The exploitation of small hydro-power potentialities are often neglected by the government hydro-power departments, because of their small size. The fruitful participation of the private sector is also often not forth-coming in the absence of a clearly defined use-rights, particularly small and micro hydro sites.

In many rural areas, these use-rights for water and energy are not well established through legislative mechanisms; and at the same time, there are no local level institutions which are capable of resolving potential water-use conflicts that are likely to arise when private/commercial exploitations of these resources proceed. The changes in legislation can only be brought about through the advocacy from the central planning institutions in collaboration with elected political cadre.

Similar problems are being faced in the introduction of fast growing tree species for fuelwood or fodder production in general, when attempts are made at community afforestation. The participation in the planting, protecting, husbanding and harvesting activities in community owned schemes often dwindle when institutional innovations required to ensure the equitable distribution of future afforestation benefits are not forth-coming. Thus very often, the technically established energy potentialities of these community owned/operated forests are vindicated in reality. Often, the pre-conditions are legislation which provides for a judicial and legal framework, under which particular use or ownership rights may be operationalised.

The development of hydro-power resources in Nepal had not been able to draw much private sector investments in the past, because of various inadequacies in the existing legal and regulatory environment for power generation, transmission and sales. The major institutional policy change has been represented by the new electricity act, which provides security and predictability for the private investors, in terms of power buy-back guarantees, and third-party access to the transmission grid. The effectiveness of such changes in institutional policies (of curbing the monopsonistic power of the electricity authority), are yet to be seen, however, there are already positive responses from the private sector.

Similarly, initiatives are afoot to establish leasehold forestry (initially designed for landless and below the poverty-line), which may be able to enhance participation of the rural poor in the agroforestry and commercial forestry activities.

5. INSTITUTIONAL LINKAGES AND COORDINATION NEEDED AT THE MACRO AND MICRO LEVELS

The decentralized rural energy planning requires the establishment of institutional linkages and coordination between various line agencies, financial and credit institutions, and the technology institutions, both at the macro and the micro levels. At the macro level, inter-sectoral and inter-agency coordination are necessary in policy making, planning, resource mobilization, programme implementation, monitoring and evaluation. Establishment of specific administrative procedures for policy, programme and project formulation needs to be established, with clear demarkation of lines of authorities and responsibilities. Similarly, the procedures for implementation, monitoring and evaluations need to be setup, again with clearly defined and unambiguous responsibilities and authorities. Such procedures need to be defined

not only for governmental units, but also for the non-governmental organizations and private sector participants.

Local level coordination are needed to bring about an effective participation of all the relevant component units of various line agencies in policy, programme and project formulation. The coordination functions usually rests with the local level planning units (such as DDCs). Establishment of specific administrative procedures for policy, programme and project formulation needs to be established, with clear demarkation of lines of authorities and responsibilities, also at the local level. The coordination between, community groups, credit institutions, NGO's and local governmental units are also needed. The important functions of the local NGOs relate to their function as intermediaries and go-betweens in the process to help mobilize financial and technological resources, in solving energy problems at the local level. They can function well as "match-makers" in bringing together outside finance and technology to bear upon local resources in local development (energy related) activities. They can also function as conduit for finance and technological and management inputs between the line agencies (and outside donors) and the community groups.

6. CONCLUSION

In the context of fuelwood energy planning, the institutional policies are derived from the need to decentralize rural energy planning and implementation processes. There is a need to setup institutional policies related to property and use rights, which provide for effectiveness of resource management initiatives. The other institutional policies relate to the establishment of coordination mechanisms at the local level, needed for effective functioning of local NGO's, community institutions, user groups, and other local governmental and support (credit and technology) institutions.

7. BIBLIOGRAPHY

Arens, T. L. 1984. A Demonstration Approach in Agro-Forestry at Bahunipati: A Case - Study NEFTIB.10, 25-29.

Baker, P.T., The Use of Human Ecological Models in Biological Anthropology - Examples from Andes, Collegium Anthropologicum, Vol 3, No. 2, pp 157-171, 1979.

Codoni, R., Park, H., and Ramani, K.V., Integrated Energy Planning: Manual, Kuala Lumpur; APDC, 1985.

Dazhong, W. and Pimentel, D., Energy Flow Through an Organic Agro ecosystem in China, Agriculture, Ecosystems and Environment, Elsevier Science Publishers B.V., Amsterdam, 1984.

Jansson, A.M., and Zuccheto, J., Energy, Economic and Ecological Relationships for Gotland, Sweden, Ecological Bulletins No. 28, Swedish Natural Science Research Council, 1978.

Thrust and Priorities for Regional Cooperation in Wood Energy Development

by

E. Pelinck[1]

1. INTRODUCTION

The purpose of this paper is to review the need and potential for regional cooperation in wood energy development in Asia. Over the past decade a considerable amount of knowledge and experience in the wood energy sector has been built up among organizations and institutions in the region. However not a single country has approached all aspects of wood energy development with the same level of attention and priorities. This is not surprising in a region so diverse in economic and social development, ecology, culture and institutional structures. As such wood energy development is foremost on issue that should be addressed at the local and national level.

2. PROBLEMS TO BE ADDRESSED

Other papers in this seminar have described in an exhaustive and detailed way the various problems governments, NGO's and local communities are confronted with when trying to improve the wood energy situation in specific countries or situations. They can be summarized as follows:

* the locally specific degradation of forest and tree resources as a result of overuse and undermanagement,

* the "underuse" of potentially well-managed resources,

* the limited use of the potential to add value on site through improved processing of woodfuels and related produce,

* the institutional and policy-related obstacles to improved management of the resources, wise use of these resources, adding value on-site through processing, and gaining full benefit from marketing of the produce by the producers and traders,

* the use of less preferred, inferior non-woody biomass fuels,

* the drudgery, health damage and economic damage through the unwise use of woodfuels for domestic cooking and commercial processing, and related obstacles in the use of woodfuels to realizing its full potential as a renewable energy source,

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* the limited data base and institutional capability for collecting and analyzing wood energy data,

* the weakness of techniques and methodologies for incorporating woodfuel issues in energy and forestry planning,

* the limited recognition of the potential of woodfuels, and of those who depend on them for energy and income, in major national policy objectives, particularly in forestry and land use policies, in energy policy, and in rural development or informal sector development policies,

* the lack of appreciation of the economic value of woodfuels and lack of public sector budgetary support to wood energy,

* the lack of expertise in the field of wood energy development,

* the lack of administrative and institutional linkages between the wood energy and other related sectors.

The majority of these problems can best be addressed through national programmes by national and local organizations within the specific institutional, social and economic structures that exist at that level. However a number of these problems are not locally specific and national organizations could benefit from regional cooperation and support.

3. PRINCIPLES OF REGIONAL COOPERATION AND SUPPORT

The Asia Pacific Region counts hundreds of regional organizations, institutions, programmes and projects. Many of them have their headquarters in Thailand, like ESCAP, AIT, FAO's Regional Office for Asia and the Pacific and our own Regional Wood Energy Development Programme, to mention just a few. They have basically a mandate in economic and social development. Others like ASEAN and SAARC are both political and developmental in nature. For the purpose of this meeting we restrict our discussions to the scope for regional cooperation in the technical and professional field and in particular to wood energy development. The following principles apply to projects of this type.

A regional cooperative programme should:

a) support national activities
b) promote technical cooperation among developing countries (TCDC) in the region
c) facilitate the transfer and sharing of information between countries
d) provide a cost effective way of generating new knowledge of relevance to the region
e) provide a cost effective way for collective training of national functionaries
f) facilitate access to human resources and technical skills within and outside the region for advisory services, including the formulation of projects
g) facilitate access to potentially available sources of financial support to national programmes
h) facilitate the forging of intersectoral linkages at regional and national level.

4. REGIONAL WOOD ENERGY DEVELOPMENT PROGRAMME IN ASIA FUTURE AGENDA (1993-1995)

4.1 Formulation Process

Approximately one year before the end of the present project the formulation process for a follow up project was started and a draft project outline or Project Formulation Framework (PFF) was prepared, based upon

a) the conclusions and recommendations of the report of the evaluation that look place in March 1992
b) the reaction of the Government of The Netherlands to the evaluation report
c) internal review within RWEDP, assisted by a consultant from within the region
d) discussions with experts and senior officials of various Government Organization in several of the member countries.

By mid December 1992 this Project Formulation Framework was completed and sent to nearly 100 institutions organizations and individuals in and outside the 11 member countries. Institutions in all eleven countries reacted within a very short time with substantive comments which were incorporated in a draft project document that is presently being cleared in FAO Headquarters for submission to the Government of The Netherlands.

The following paragraphs are extracts from that project document for the information of and comments by the participatns only. They still can be modified during consultations with the prospective donor government.

4.2 Objectives

The long term development objective of the programme is:

to contribute to a sustainable production of wood fuels, their efficient processing and marketing, and their rational use for the benefit of households, industries and other enterprises.

The development objective addresses the following major sector policies and priorities:

Forestry: the improved management of tree and forest resources by villagers, including adding value on-site through processing and marketing support,

Energy: the development of renewable, indigenous sources of energy to contribute to diversification of energy mix and self-sufficiency in energy supply,

Poverty alleviation:

to improve the livelihoods of rural people and those working in informal sector activities, among others by generating income and employment,

Environment: to arrest the degradation of forest resources and other land use systems, through sustainable patterns of natural resource management and utilization and to contribute to efforts to reduce greenhouse gas emission,

National economic considerations:

more productive uses of local (woodfuel) resources and providing an additional energy supply option for economic growth and development, and,

Women: to create the opportunity for women, play an important role in planning and implementation of wood energy programmes and strategies.

This project addresses the (potential) concerns of institutions and people, whose policies, programmes and actions are affecting the production and use of woodfuels. They can be grouped in three:

* those who collect, organize and analyze information to provide the analytical basis for formulating policies and defining development plans and strategies involving wood energy

* those who define and choose policies, programmes and strategies including the prioritization of projects, activities and the allocation of resource inputs to them and

* those who execute the programmes and strategies and implement the projects and activities.

The programme has identified the following three immediate objectives to address and achieve within the project's period:

1) To contribute to an improved database on wood energy at regional and national level and to improve the capacity of institutions to generate, manage and assess such data at regional, national and subnational level.

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

3) To improve the capabilities of government, private and community-based organizations in implementing wood energy strategies and programmes.

4.3 Target Beneficiaries

The target groups and beneficiaries can be divided into those who are directly affected by programme activities and those who are expected to be the ultimate beneficiaries.

Immediate beneficiaries

The immediate beneficiaries and partners of the project are:

a) More than 2,000 staff of government, non-government and private organizations who will be trained in particular wood energy related subjects.

b) Thousands of individual workers in the field of wood energy who will benefit from documentation and information by the projects.

c) Several regional organizations and projects that can have an important impact on wood energy use in the future.

Ultimate beneficiaries/target beneficiaries

The groups of people ultimately expected to benefit from the project are the rural and urban poor, men, women and children who depend on fuelwood and related produce for energy and income. They are the woodfuel producers and traders, the woodfuel purchasing and subsistence households and people working in traditional and modern woodfuel using industries.

Government Organizations, Research Institutes and Non-Government Development Organizations, in particular those working in forestry, energy, rural development and informal sector development, are expected to benefit directly from the project by becoming better equipped for the tasks they are charged with.

The project will have 5 groups of target beneficiaries with very different wood energy needs.

a) Woodfuel producers and traders

These are the people who can earn an income from involvement in the wood energy sector.

b) Subsistence households and landless poor

Being outside the monetary economy, subsistence households are highly dependent on trees on own or common property lands for their own use.

c) Woodfuel purchasing households

These are the households that spend money to acquire woodfuels for domestic purposes.

d) Traditionally woodfuel using industries and enterprises

There are the industries and enterprises that over long periods of time have used fuelwood and charcoal.

e) Potentially woodfuel using enterprises

These are the industries with a potential for using woodfuels.

Figure 1 shows the partner organizations and the 5 groups of ultimate beneficiaries for which they are expected to act as the delivery systems.

Figure 1: Project Beneficiaries

PARTNER ORGANIZATIONS	ULTIMATE BENEFICIARIES
- Institutions dealing with agroforestry and social forestry activities, e.g., Forestry Departments and Agricultural institutions which could be of relevance for wood production on agricultural land; Research institutions and NGO's. - RWEDP will be collaborating with/sponsor fuelwood production related activities carried out by APAN and FTPP, F/FRED, etc. - Agencies formulating energy and forestry plans and policies with potential impact on the ultimate beneficiaries.	**WOOD FUEL PRODUCERS/TRADERS** - People earning an income from (i) growing or managing trees and forests on their own or common property lands, (ii) trade in woodfuels, (iii) processing wood for charcoal.
- Institutions dealing with agroforestry and social forestry activities. - Forestry Departments. - Agricultural institutions which could be of relevance for wood fuel production on agricultural land-Government institutions and NGO's with wood fuel user supporting activities. - NGO's capable of assisting subsistence households.	**SUBSISTENCE HOUSEHOLDS** - People growing or managing trees and forests for their own use on private or common property lands. - Landless people. - Women and children operating wood/biomass cooking systems.
- Government institutions and NGO's with wood fuel user supporting activities. - Industries organizations developing devices which will be of benefit to woodfuel purchasing households. - NGO's capable of assisting woodfuel purchasing household. - Agencies formulating energy plans and policies with potential impact on the ultimate beneficiaries.	**WOOD FUEL PURCHASING HOUSEHOLDS** - People who spend money to acquire woodfuels for domestic purposes. - Women and children operating wood/biomass cooking systems.
- Government institutions, industries organization and NGO's capable of assisting traditional woodfuel using industries in improving energy consuming systems and industries' productive enhancement. - A few traditional woodfuel using industries are expected to benefit directly from pilot activities. - Agencies formulating energy plans and policies with potential impact on the ultimate beneficiaries.	**TRADITIONALLY WOOD FUEL USING INDUSTRIES AND ENTERPRISES** - People earning an income from owning or employment in traditional industries and enterprises.
- Government institutions, industries organizations capable of assisting modern industries in improving wood/biomass energy consuming systems. - A few modern woodfuel using industries are expected to benefit direct from information service and consultancy facilitation. - Agencies formulating energy plans and policies with potential impact on the ultimate beneficiaries.	**POTENTIALLY WOODFUEL USING ENTERPRISES** - People earning an income from employment or otherwise through the existence of modern woodfuel using industries.

4.4 Project Strategy

To address the problems described in the previous paragraphs the project will follow a strategy of a long term 5 years commitment in support of regional and national level activities. As a regional project operating in up to 15 countries the main strategy will be to make use of existing national and regional structures and institutions and to be complementary to or reinforcing wood energy related initiatives at national and regional level. Mutually reinforcing activities would ensure that critical masses of knowledge and capabilities in the wood energy sector would be developed. The project strategy as well as the whole project document builds to a large extent on the conclusions and recommendations of the Evaluation Mission of March 1992, the Project Formulation Framework and the comments on it from member countries, FAO Headquarters, the Government of The Netherlands and a special review team. The project will be implemented as a regional project for a period of five years covering up to 15 countries.

Sectoral strategy

The main focus of the project will be on wood energy. Other types of biomass will be taken into account when they have an impact on wood energy. This will in particular apply to issues relating to data assessment, policies and planning. While the project will cover all issues affecting wood energy in the region, it will concentrate its activities on the following subsectors.

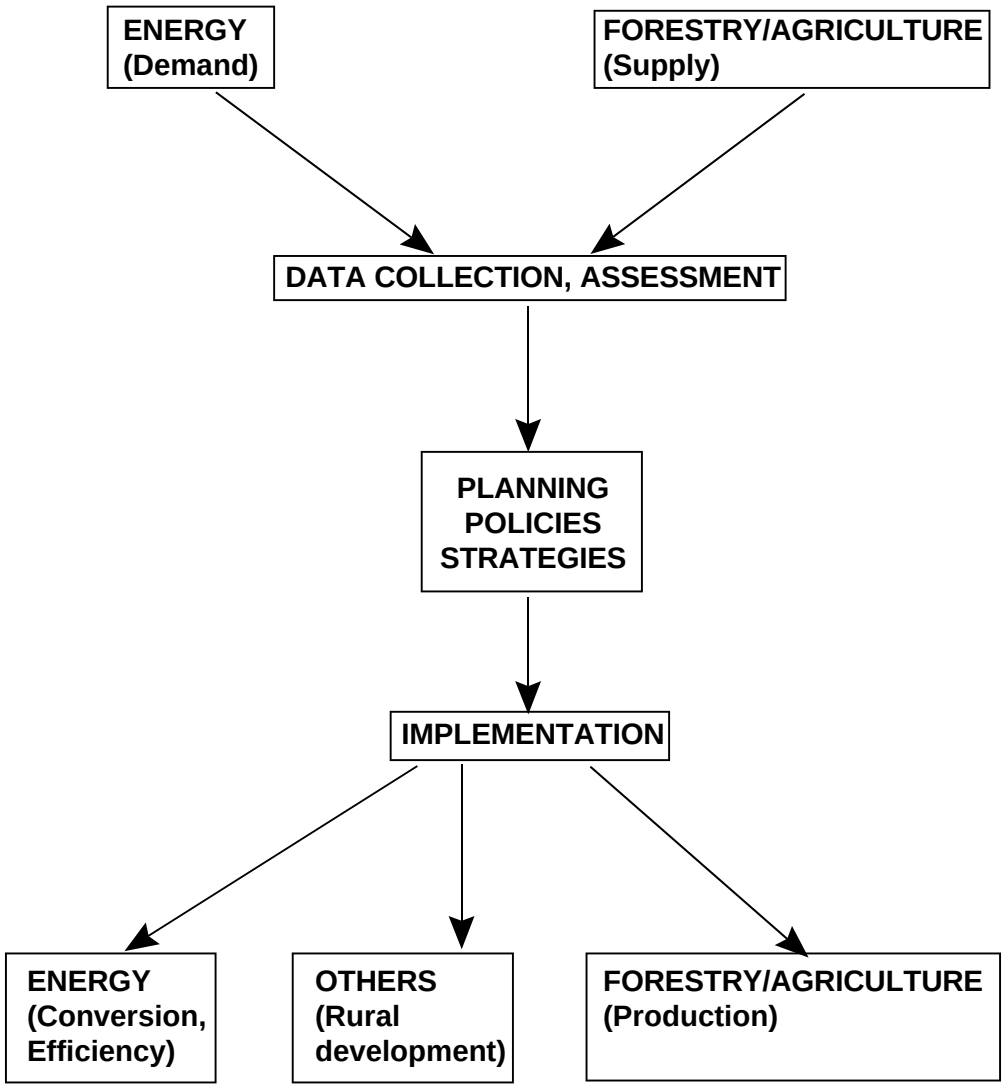
(i) policies and strategies
(ii) data assessment and planning
(iii) wood energy conservation and efficient utilization
(iv) woodfuel *distribution* and trade.
(v) woodfuel production

On the first *4* subsectors, the project will use its own professional and financial resources to generate, disseminate and transfer information and knowledge. Partly as a result of RWEDP's *success in promoting community forestry* there are now a sufficient number of national and regional institutions, organizations and projects that have the professional capabilities to conceive programmes with a positive impact on the woodfuel supply. Considering the huge need for training additional manpower that is needed to implement such programmes, the project will make financial resources available complementary to those of other projects, with a specific regional (RECOFTC, FTPP, APAN) or national mandate.

In all subsectors the project will give systematic and equal attention to the economic, social and technical dimensions of the information collected and the policies and programmes proposed for each subsector. The project will thereby follow a continuously evolving process of assessment, analysis, implementation and monitoring and evaluation.

Intersectoral coordination and cooperation between the energy and forestry/agriculture sectors will be a major strategy of the project, in particular in the fields of data collection and analysis, policies, strategies and planning. In the implementation of policies and strategies a more traditional sectoral approach is suggested, as shown in figure 2.

Figure 2: Intersectoral Coordination



Human resources development

The lack of attention wood energy presently receives is to a large extent the result of the lack of capacity the member countries have in generating and assessing wood energy related data and using this information for the development and implementation of policies and strategies that acknowledge and incorporate the importance of wood energy. The major thrust of the project will be on developing that capability through a comprehensive training and awareness raising programme. A critical mass of well informed policy makers, planners and implementors in each participating country will then ensure that the problems and potential of wood energy are adequately addressed. Training and awareness raising will be closely linked with the institutional structures to be established in each country and which are described in chapter B 5. Members of the National Advisory Committees and the National Wood Energy Working Groups, individually and jointly, are expected to become much better equipped to deal with wood energy issues in the participating countries.

4.5 Institutional Framework

Implementing agencies

As the project addresses problems at the interface of the energy and forestry sector its activities will be coordinated at the national level by the government departments representing both sectors. Individual activities responding to specific needs are however expected to be implemented by those agencies and organizations best equipped in that particular subsector. To ensure that relevant departments, institutions and organizations can contribute to and benefit from the intersectoral approaches the project promotes, participating countries will use existing or establish new structures for broad overall coordination of national activities and guidance of regional ones. Such a group should be at the level of policy makers and meet only once or twice a year. In many of the participating countries the NATCOMS, established under RWEDP could serve this function, taking into account the new approaches adopted in the present project. Its composition and detailed terms of reference should reflect the priorities of the individual country and evolve overtime. Some broad suggestions are included in Annex 5.2.

In addition each country will facilitate technical cooperation and coordination at the working level by establishing a National Wood Energy Working Group. The members of this core team of local experts would be full-time staff of institutions and organizations represented in the National Committee. These teams would have direct access to information from RWEDP and be a communication channel on technical issues for the project with each country. When technical working groups on project related subjects are already existing or are envisaged one or two members of such a working group should be also members of the core team. Some suggestions for the terms of reference and composition of the National Wood Energy Working Groups are presented in Annex 5.3.

At the regional level the project will closely cooperate with regional institutions with a mandate in wood energy. To ensure sustainability of some of the key features of regional cooperation after the project ends institutes with a geographical coverage largely coinciding with that of the project will be selected. The following regional institutions have indicated a clear interest in cooperation:

Asian Institute of Technology (AIT)
- Training
- Dissemination of Information

International Centre for Integrated Mountain Development (ICIMOD)
- Analytical studies
- Training

Asia Pacific Development Centre (APDC)
- Policy studies

FAO Regional Office for Asia and the Pacific
- Statistics
- Forestry and agricultural policies

It is envisaged that these institutions take on a number of the regional tasks in wood energy planning and conversion in a similar way as the Regional Community Forestry Training Centre (RECOFTC) has taken over the information dissemination and some of the training activities in the field of community forestry at the end of the second phase of RWEDP. In addition the project will cooperate and coordinate its activities with regional projects with closely related objectives.

Implementation structure

The project will be implemented by a core team of internationally recruited experts strengthened by consultants for specific tasks and junior professional officers who both will learn from and contribute to the project (see also chapter E. Inputs).

As a regional project without daily contacts with the immediate nor target beneficiaries in each of the participating countries provisions will be made that the views and needs of individual countries are well reflected in the project's activities.

For this purpose there will be a high level Regional Advisory Committee (RAC) consisting of one senior official each of the Departments of Energy and Forestry of the participating countries and representatives of a limited number of key regional institutions and projects. The RAC will provide broad strategic advise on the direction of the project and the contents of the five-year and annual workplans. The Committee will meet three times during the project's five year period, the first one soon after the agreement between FAO, member countries and the donor has been signed. The linkages between the various committees and working groups with the project team are shown in Figure 3.

To ensure that each of the participating countries can benefit directly from the project, draft annual workplans together with budget proposals will be prepared jointly by the National Wood Energy Working Groups and National Wood Energy Committees and submitted to the project. Draft headings for annual workplans are presented in figure 4.

Figure 3: Institutional Framework for Project Implementation

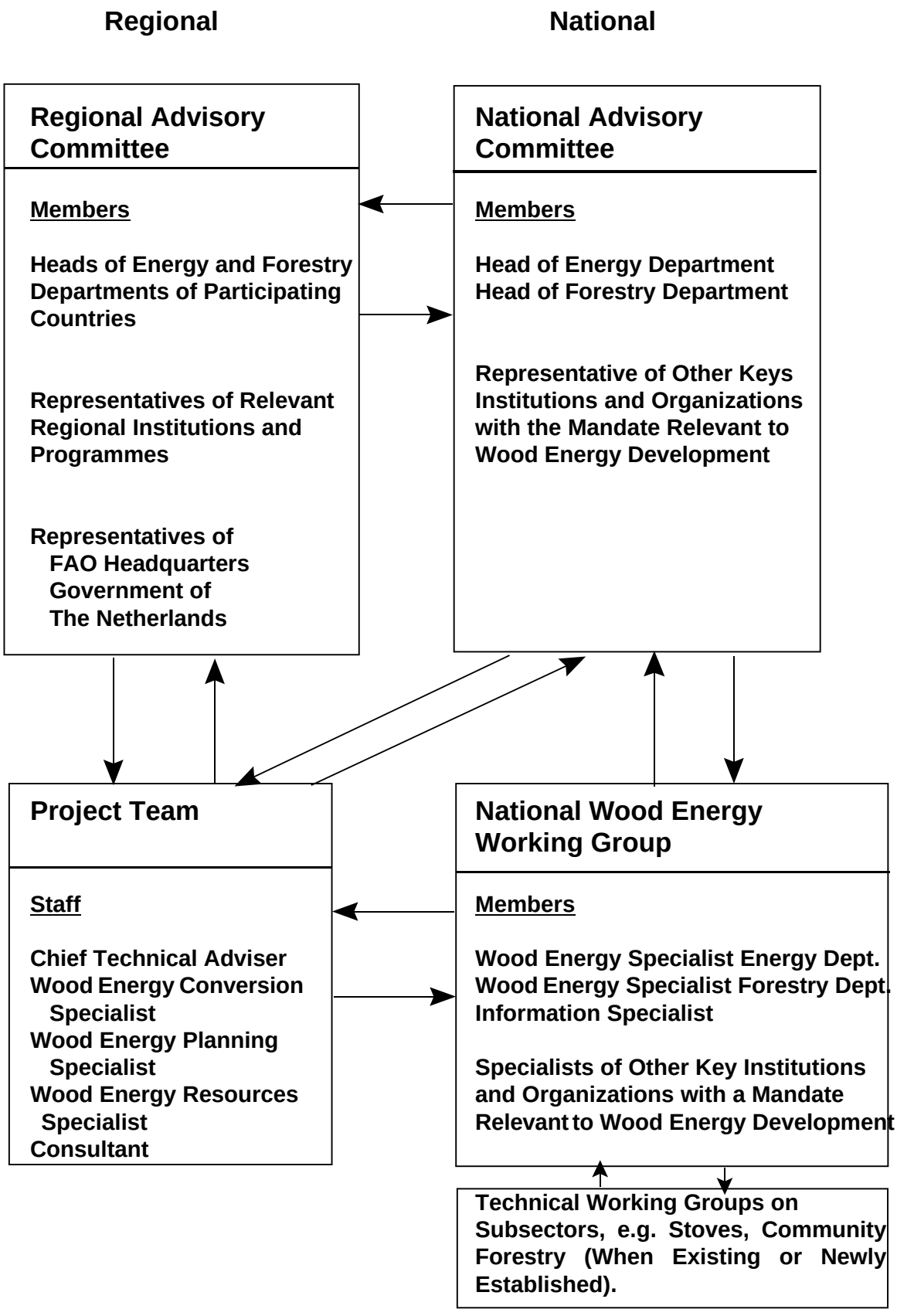


Figure 4: Country Work Plans

RWEDP - (Country)

Workplan for the year .....

1. Participation in regional workshops, training, etc.
   1.1 (Title) (no of persons to be nominated)
   1.2 -do- -do-
   1.3 -do- -do-

2. National workshops, training courses, etc.
   2.1 (Title) (Target group) (no of participants)
   2.2 -do- -do- -do-

3. Case studies
   3.1 (Title) (Implementing agency/person)

4. Participation in internship/fellowship programme
   4.1 (Name) (Function, organization) (country)

5. Consultancy services
   5.1 (Subject) (Target beneficiaries) (no of man months)

6. Documentation and information
   6.1 Wood Energy News (number distributed)
   6.2 RWEDP project publications
   6.3 Other documents

7. Country contribution
   7.1 Hosting study tour
   7.2 Hosting of regional meeting
   7.3 Contribution to information sharing network
   7.4 Availability of TCDC consultants (note types of expertise)

8. RWEDP operational meetings

9. Meetings of National Advisory Committee

10. Meetings of Wood Energy Working Group

11. Other special needs

4.6 New Dimensions in Project Execution

A number of specific operational measures are proposed that emphasize the country focus and technical cooperation among developing countries.

a) Country focus

Through an annual workplan and annual reports each country's identity in RWEDP will become clearer and will assist in defining "tailor made" activities responding to the needs of each country.

b) TCDC consultants

The project will facilitate the availability for support from one member country to the other by providing costs of travel and DSA for experts from these countries.

c) Internships

The project will provide support to selected members of National Wood Energy Working Groups to work in RWEDP's project office in Bangkok or selected centers with a proven record on relevant subjects. These internships are expected to last 2-6 weeks and will be supervised by the respective specialists of the project and/or specialists of the host centers in the member countries. To make most efficient use of the time of the supervisers and to promote regional networking, preferably teams of 3 interns from 3 different countries will be formed for each internships.