



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



**SUMMARY REPORT  
OF NATIONAL TRAINING COURSE ON  
WOODFUEL PRODUCTION AND MARKETING IN FOREST,  
AGRICULTURE AND TREE PRODUCTION SYSTEMS**

**HANOI, VIETNAM  
17 - 20 April 1996**



**FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS  
Bangkok, October 1996**

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## FOREWORD

The National training course on “Woodfuel production and marketing in forest, agriculture and tree production systems” was conducted by the Forest Science Institute of Vietnam (FSIV) in collaboration with the Regional Wood Energy Development Programme in Asia (RWEDP) from 17 to 20 April 1996, in Hanoi.

The purposes of the training course were as follows:

- ! To provide a forum for reviewing the problems related to the production, marketing and use of biomass energy in Vietnam; disseminating knowledge on wood energy; and upgrading the understanding of the interrelations of woodfuel actors from several economic sectors.
- ! To enable participants to acquire the necessary information for formulating guidelines and strategies for implementing wood energy development programmes, not only in the energy and forestry sectors, but also in the different sectors concerned with agriculture and rural development.
- ! To promote the cooperation of the public sector, NGOs and private enterprises for improving the production, marketing and utilization of wood fuel.

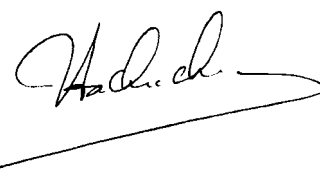
The papers presented at the training course covered topics related to assessing the wood energy supply and marketing situation in Vietnam; the use of biomass, including wood and agriculture residues as sources of domestic and industrial energy; and economic aspects of biomass fuel. These papers were written and presented in Vietnamese but English language summaries were subsequently prepared and are contained in appendix 7.

The majority of the training course participants were technicians and experts from various central and provincial public institutions responsible for rural energy. There were also participants from a number of NGOs and private enterprises.

The training course was, by all accounts, highly successful. We express our sincere thanks to RWEDP for financial support and for assistance in organizing this training course.

Dr. W. Hulscher  
Chief Technical Adviser  
FAO/RWEDP

Dr. Ha Chu Chu  
Director of FSIV



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## **SUMMARY**

This summary report consists of two parts.

Part 1 contains a brief account of the background and objectives of the course, the participants, venue, duration, the training process and the methodologies used. It also briefly introduces the seven papers and case studies which were presented in the course. Finally, the conclusions and recommendations of the training course are presented.

Part 2 includes eight appendices consisting of the detailed course programme, a list of course participants and their profiles, a list of staff and resource persons, brief descriptions of the field visit sites, an English language summary of the paper and case studies which were written and presented in Vietnamese, and photographs illustrating some of the training course activities.

## **LIST OF ABBREVIATIONS**

ARDD	Agriculture and Rural Development Department
FAO	Food and Agriculture Organization
FSIV	Forest Science Institute of Vietnam
FSTAC	Forest Science - Technology and Application Centre
GO	Government Organization
IOE	Institute of Energy
MARD	Ministry of Agriculture and Rural Development
MOI	Ministry of Industry
MPI	Ministry of Planning and Investment
NEFSPC	North East Forest Science And Production Centre
NGO	Non- Government Organization
PO	Private Organization
RWEDP	Regional Wood Energy Development Programme
VASI	Vietnam Agriculture Science Institute

# 1. INTRODUCTION

## 1.1. Background

The Regional Wood Energy Development Programme in Asia (RWEDP) of the Food and Agriculture Organization (FAO) of the United Nations organized a subregional training workshop on "Integrating Wood fuel Production into Agroforestry Extension Programmes in Southeast Asia", in April 1995 in West Java (Bogor), Indonesia, for its eight member countries in the sub-region, including Vietnam.

Considering the important role of wood energy in total energy consumption in the subregion (i.e. low consumers: China-7%, Malaysia-10%; high consumers: Lao PDR-88%, Myanmar-74% and Vietnam-50% in 1991), RWEDP organized the subregional training workshop to increase awareness of the potential that integrating woodfuel (fuelwood and charcoal) production into agricultural systems, including all rural extension schemes/programmes in a broader sense, has in sustaining the supply of woodfuel. RWEDP considers that the effective dissemination of information is essential at different levels (i.e. GOs, NGOs and POs) in order to assist member countries to enhance their knowledge and capabilities in planning and implementing programmes that could support the woodfuel producers (farmers), by generating additional income for them, from their involvement in the development of wood energy and related forest and tree products.

The subregional training workshop had the following four specific objectives:

- ! to network participants from GOs, NGOs and POs who can contribute towards integrating woodfuel production into agroforestry extension programmes
- ! to develop the participating countries' abilities to design and implement national workshops/training courses which aim to integrate woodfuel production, distribution and marketing into agroforestry extension programmes, for enhanced economic development through sustainable landuse practices
- ! to enhance the capacity of member countries to plan and implement integrated agroforestry extension programmes, through exchange of information and experiences in production, distribution and marketing of woodfuel from integrated farming systems
- ! to identify and plan follow-up training activities at the national level.

After having successfully organized this sub-regional information dissemination programme. In Indonesia, in which three persons from Vietnam - one each from the Forest Science Institute of Vietnam (FSIV), the Institute of Energy (IOE) and the Vietnam Agriculture Science Institute (VASI) -- participated, RWEDP then initiated country level follow-up activities to enhance the knowledge and capacity of member countries, primarily through area specific case studies and national training courses on a related theme. The Forest Science Institute of Vietnam (FSIV), Ministry of Agriculture and Rural Development (MARD) -- the forestry focal point in the country -- was selected by RWEDP to organize the national training course on "Woodfuel Production and Marketing in Forest, Agriculture and Tree Production Systems" in Vietnam.



## 1.2. Training Workshop Objectives

The specific objectives of the national training course on "Woodfuel Production and Marketing in Forest, Agriculture and Tree Production System" were to:

- ! network participants from GOs, NGOs and POs who have contributed to and are likely to continue to the further development of woodfuel production and distribution in the country
- ! enhance their knowledge and understanding of the role of woodfuel in the rural socio-economy and national energy balance, including marketing of privately grown trees, and to identify strategies which will enhance woodfuel production/supply
- ! develop their capacity to formulate and implement integrated woodfuel development programmes (including agroforestry) which will enhance economic benefits through the promotion of sustainable land use practices
- ! enhance the country's ability to plan and implement training courses to support integrated woodfuel production and marketing in forestry and agriculture extension programmes.

## 1.3. Participants

A total of 29 participants from relevant institutions and different administrative levels (i.e. central, provincial, etc.) attended the training course. Government organizations, non-government organizations and private organizations including academic institutions, which are all directly or indirectly related to the development of forestry, agriculture and energy sectors in the country, were represented and representatives included senior, middle and junior level professionals who are responsible for planning and field implementation of forestry, agriculture energy rural development. A large number had received professional training in forestry, and some in agriculture, energy and others areas. Most had obtained a B.Sc., 2 had a Diploma and 2 had only completed high school. Female representation was 20%. Most participants work in forestry and agriculture institutions. The majority of the participants (24) work with government organizations, 2 in NGOs and 3 in POs. Average age of participants was around 44 years. A list of participants and their profiles is contained in appendices 2 and 4.

## 1.4. Training Session

The training course was conducted over four days at the FSIV office in Hanoi. All sessions were conducted in Vietnamese. In the opening session, the audience heard speeches by representative from FSIV, MARD, FAO Hanoi, MOI and STRAP projects. Seven papers and case studies were presented on the first two days and after each there was a plenary discussion (one case study was presented at a field site on the third day in Vinh Phu).

The papers and case studies covered the role of fuelwood in the national economy, especially in mountainous provinces, wood based industrial commercial activities, and the present situation of fuelwood production and marketing in Vietnam. The field trip which was organized on the third day of the course concentrated on fuelwood production in forestry plantations, fuelwood utilization by local small-scale industries and fuelwood trade by middlemen. Observations from the field trip were synthesized by filling in a worksheet (see appendix 6) was later used for group discussion. On the

final day, participants formed three groups to discuss the major topics of the course: production and utilization; marketing and extension and support services.

This was followed by group discussions by geographical area (three groups). After each discussion period a summary of the discussion was presented by each group leader. A participants' evaluation was conducted to determine what new knowledge they obtained by participating in the course. Finally, the course closed with a program evaluation exercise and with verbal feed back from participants.

## **1.5. Methodology**

The course was conducted by employing an appropriate mix of lectures, plenary discussions and field trips. The lectures were delivered by Vietnamese experts in various aspects of woodfuel production, marketing or management and generally took the form of case studies or overview papers. After each paper or case study time was devoted to plenary discussions. The field trip sites were carefully chosen to ensure that they were comprehensive in scope and all participants were briefed about each site prior to visiting it. A worksheet enumerating items for observation was distributed to the participants to help them organize their thoughts once in the field. The field visits were followed by group discussions where all participants were given an opportunity to comment on the observations of their fellow participants and to share their own observations. Participants also verbally evaluated the field trips in terms of their usefulness in conveying new knowledge in a practical manner.

## **1.6. Evaluation**

Before the closing session, the training course was evaluated independently by the course participants and by members of the Organizing Board which was established specifically to organize the training. The participants used a written evaluation form and concentrated their efforts on evaluating the effectiveness of the training course in terms of knowledge enhancement. Topics covered by the participants included knowledge and competence of resource persons, usefulness/adequacy of the field trips and various logistical matters. The Organizing Board gave verbal reports and focused on logistical issues. In particular, they tried to identify as objectively as possible the course's strong points and weak points.

## **2. INTRODUCTION TO PAPERS AND CASE STUDIES PRESENTED IN THE COURSE**

Seven papers and case studies were presented during the course (see English language summaries in appendix 7).

A paper on the role of fuelwood in the national economy was presented by Mr. Vu Long, FSIV. It covered the country's energy use pattern, its rate of energy consumption and the ratios of commercial fuel and fuelwood, demand and supply of woodfuel and the importance of woodfuel in Vietnam. It also looked at some important issues and constraints in fuelwood production and utilization. Finally, the author drew conclusions and put forward recommendations.

A case study on the role of fuelwood in daily life and on socio-economic development in the northern mountain highland provinces of Vietnam was presented by Mr. Doan Bong, FSIV. Its framework was similar to paper 2.1, but dealt with a specific area in Vietnam.

A case study on wood based industrial commercial activities and their contribution to the national economy was presented by Mr. Luu Tin, FSIV. It consisted of the following: a general introduction; socio-economic aspects of biomass energy, biomass energy supply and reproduction, the main issues in wood fuel supply, woodfuel energy development and the author's conclusions and recommendations.

A case study on fuel production from the agricultural based sector at farm- household level, including woodfuel production from scattered tree planting on non-forest areas was presented by Mr. Dau Quoc Anh, VASI. The author confirmed the important role of agricultural-based woodfuel in rural areas, introduced/described sources of fuel production, the main constraints on fuel production and recommendations for improving production.

A case study on the role of non-forest areas in wood fuel production in Vietnam was prepared by Mrs. Nguyen Thi Quy and presented by Nguyen Duy Thong, IOE. According to the author, 70% of the country's fuelwood demand is met by non-forest areas. The author also described the various fuel sources from non-forest areas, extension programmes in forestry and agriculture to enhance woodfuel production, key issues and constraints for development and offered recommendations for improving woodfuel production.

A case study on the fuelwood market in Vietnam was presented by Mr. Nguyen Duy Thong, IOE. The author described the important role of fuelwood and its main consumers with the emphasis on the fuelwood market in Vietnam and analyzed its characteristics.

A case study on the establishment of experimental wood plantation and fuelwood use in the Ngoc Thanh area, Me Linh district, Vinh Phu province was presented by Mr. Dao Vu, NEFSPC. The author described the general situation of the Ngoc Thanh commune, the background to the establishment of the model fuelwood plantation and the situation of fuelwood use in the locality.

## **3. CONCLUSIONS AND RECOMMENDATIONS**

### **3.1. Conclusions**

The national training course on wood fuel production and marketing in forest, agriculture and tree production systems was highly successful and achieved the objectives of RWEDP.

All participants were unanimous in recognizing the necessity and benefit of the training course and identifying the constraints in wood fuel production and marketing.

Through the training course, the participants realized more clearly the important role of woodfuel and the relationship between woodfuel and forest protection. However, the most important result is that all participants committed themselves to formulate a programme and activity plan to solve specific problem related to woodfuel in their locality, and to implement a regional energy programme as per the following recommendations.

### **3.2. Recommendations of the Training Course**

- ! Increased efforts should be made to educate the people about the important role of woodfuel and its economical usage.
- ! The natural forest should be exploited only in a sustainable manner and with due attention to protecting the environment.
- ! Scattered tree planting, forest gardens and forest farm establishment should be increased.
- ! Research on the improvement of fast growing tree species, multipurpose tree species, techniques of intensive forest management should be promoted, cooking stoves with high heating efficiency should be developed.
- ! Programmes to support woodfuel planting households should be established in relation to:
  - Credit
  - Seedlings
  - Techniques
  - Resource tax exemption on the first rotation.
- ! Policy and measures to manage the wood fuel market and to maintain it on a sustainable basis should be introduced.
- ! A national program on improved stoves with high heating efficiency suitable to specific geographical areas should be developed and support should be given to people using them.
- ! Woodfuel issues should be addressed as part of an overall forest and energy resources management program and in the long-term forest resources should be protected and developed by updating the data base of biomass fuel supply and demand.

## 4. APPENDICES

### 4.1. Appendix 1: Detailed Programme

#### 17 April 1996

08.30 - 12.00	Registration
09.00 - 09.30	Opening ceremony - Welcome speech ( <i>Dr. Ha Chu Chu, Director, FSIV</i> ) - Speech: - FAO Hanoi, Mr. Pham Gia Truc - MOI, Dr. Dang Ngoc Tung - RWEDP, Mr. Tara N. Bhattarai - TRAP, Mr. David Cameron
09.30 - 10.15	Participants' introductions Training course objectives and structure ( <i>Mr. Bhattarai, RWEDP</i> )
10.15 - 10.30	Tea break
10.30 - 12.00	General position paper on wood energy ( <i>Mr. Vu long, FSIV</i> )
12.00 - 13.30	Lunch
13.30 - 14.00	General position of wood energy - continued ( <i>Mr. Vu Long</i> )
14.00 - 15.45	Area specific case study ( <i>Mr. Doan Bong, FSIV</i> )
15.45 - 16.00	Tea break
16.00 - 17.00	Plenary discussion ( <i>Mr. Doan Bong, Mr. Bhattarai, Mr. Vu Long, Mr. Nguyen Chi Trung</i> )

#### 18 April 1996

08.30 -10.00	Fuel production from agriculture - based sector at farm household level, including woodfuel production from scattered tree planting on non-forest area ( <i>Mr. Dau Quoc Anh, VASI</i> )
10.15 -11.30	Role of non-forest areas in woodfuel production ( <i>Mr. Nguyen Duy Thong, IOE</i> ).
11.30 - 12.00	Plenary discussion ( <i>Mr. Dau Quoc Anh, Mr. Nguyen Duy Thong, Mr. Bhattaria, Mr. Nguyen Chi Trung</i> )

12.00 - 13.30	Lunch
13.30 - 14.30	Woodfuel based industrial and commercial activities and their contribution to the national economy <i>(Mr. Luu Tin, FSIV)</i>
14.30 - 15.00	Plenary discussion <i>(Mr. Luu Tin, Mr. Ha Chu Chu, Mr. Tara N. Bhattarai, Mr. Nguyen Chi Trung)</i>
15.00 - 15.15	Tea break
15.15 - 16.30	Markets and marketing of woodfuel <i>(Mr. Nguyen Duy Thong)</i>
16.30 - 17.00	Plenary discussion <i>(Mr. Nguyen Duy Thong, Mr. Tara N. Bhattarai, Mr. Nguyen Chi Trung)</i>

### **19 April 1996**

08.30 -12.00	Field visit to North-East Forest Science and Production Centre  Wood fuel production and market in Me Linh district <i>(Mr. Dao Vu)</i>  Visits to some experimental woodfuel plantations <i>(Mr. Nguyen Chi Trung Trung)</i>
12.00 - 14.00	Lunch
14.00 - 17.00	Visits to some woodfuel base industries and wood fuel markets around Hanoi <i>(Mr. Long, Mr. Thong, Mr. Trung)</i>

### **20 April 1996**

08.30 -10.00	Identification of major constraints and issues <i>Group discussion (three groups)</i> <i>(Mr. Ha Chu Chu, Mr. Vu Long, Mr. Nguyen Duy Thong, Mr. Dau Quoc Anh, Mr. Bhattarai, Mr. Nguyen Chi Trung)</i>
10.00 - 10.15	Tea break
10.15 - 12.00	Group presentations  Video "Wood afforestation on different ecological zones"
12.00 - 13.30	Lunch

13.30 - 15.00	Identification of relevant topics by specific geographical areas ( <i>Mr. Ha Chu Chu, Mr. Vu Long, Mr. Bhattar, Mr. Nguyen Duy Thong, Mr. Dau Quoc Anh, Mr. Nguyen Chi Trung</i> )
15.00 - 15.15	Tea break
15.15 - 16.30	Programme evaluation and participants' feedback ( <i>Mr. Ha Chu Chu</i> )
17.00	Farewell dinner

## 4.2. Appendix 2: List of Participants

Mai Thanh Cat  
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ARDD, Hanoi  
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Nguyen Nhu Ho  
ARDD, Vinh Phu  
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Truong Thi Minh  
VASI, Thanh Tri, Hanoi  
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Leu Manh Hung  
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MOI  
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Cao Bang province  
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Da Ton village  
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ARDD Hoa Binh  
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ARDD, Ninh Binh  
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Le Oanh Vu  
ARDD, Daklak

Nguyen Van Vu  
ARDD, Son La  
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### 4.3. Appendix 3: Staff and Resource Persons

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Me Linh, Vinh Phu  
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#### **4.4. Appendix 4: List of Delegates**

**RWEDP** Mr. Tara N. Bhattarai, Wood Energy Resource Specialist

**FAOR Hanoi** Mr. Pham Gia Truc

**STRAP** Mr. Cameron  
Team Leader RAS/142

Mr. Frede Danborg  
Assistant RAS/142

#### **Afforestation project in Lang Son and Ha Bac provinces**

Mr. Hubertus Kriaenhost  
Chief Technical Advisor

#### **Ministry of Agriculture and Rural Development**

Mr. Do Van Nhuan  
Vice Director of Agriculture and Forestry Extension Department

#### **Ministry of Industry**

Mr. Dang Ngoc Tung  
Director of Science and Technology Department

#### **Ministry of Planning and Investment**

Mr. Huynh Thach  
Senior Expert , Agriculture and Rural Development Department

#### **Forest Science Institute of Vietnam**

Mr. Nguyen Tien Dat  
Head of Information and Document Division

Ms. Nguyen Kim Thu  
Head of Finance and Accounting Division

Mr. Luong Huu Can  
Head of Personnel Organization Division

Mr. Le Hong Phuc  
Head of Training Division

#### 4.5. Appendix 5: Participants Profile

No	Name	Institution	GO	NGO	PO	Province	Prof. training	T	R	E	M	Degree	Gender	Age
1	Mai Thanh Cat	ARDD	x			Ha Tay	Forestry				x	B.Sc	M	40
2	Nguyen Thanh Chuong	ARDD	x			Song Be	Forestry				x	B.Sc	M	38
3	Do Duc Hai	MOI	x			Hanoi	Energy				x	B.Sc	M	47
4	Pham Thi Hong				x	Hanoi						School	F	59
5	Truong Tien Hong	ARD Division of Son Dong district	x			Ha Bac	Forestry				x	B.Sc	M	38
6	Nguyen Nhu Ho	ARDD	x			Vinh Phu	Forestry				x	-	M	37
7	Leu Manh Hung	VACVINA		x		Hanoi	Forestry	x				-	M	60
8	Hoang Hung	ARDD	x			Hanoi	Forestry				x	-	M	39
9	Vo Qui Hoanh	ARDD	x			Nghe An	Forestry				x	-	M	54
10	Dang Kim Khanh	FSIV	x			Hanoi	Botany		x			B.Sc	F	27
11	Dao Van Khoi	ARDD	x			Quang Ngai	Forestry				x	B.Sc	M	53
12	Le Kim Lien	Women's Association		x		Hanoi	-			x		B.Sc	F	44
13	Truong Thi Minh	VASI	x			Hanoi	Agriculture		x			B.Sc	F	35
14	Nguyen Phu Nghiep	FSTAC-FSIV	x			Hanoi	Forestry		x			B.Sc	M	54
15	Truong Ngoc Quang	MPI	x			Hanoi	Energy				x	B.Sc	M	58
16	Ha Manh Quy	Luc Ngan district	x			Ha Bac	Forestry				x	B.Sc	M	40
17	Phan Van Thanh	ARD division of Hoa An district	x			Cao Bang	Forestry				x	Diploma	M	34
18	Do Thap	327 plantation company			x	Yen Bai	Forestry				x	B.Sc	M	52
19	Le Thang	ARDD	x			Hoa Binh	Wood				x	B.Sc	M	46
20	Quach Thai Thiem	ARDD	x			Ninh Binh	Forestry		x			B.sc	M	43
21	Phan Thanh Thuy	IOE	x			Hanoi	Forestry		x			B.Sc	F	40
22	Nguyen Son Thuy	ARDD	x			Ho Chi Minh	Energy				x	B.Sc	M	38
23	Tran Ngoc Tri	ARDD	x			Ha Bac	Forestry				x	B.Sc	M	49
24	Dao Thi Ty	Da Ton, Gia Lam			x	Hanoi	Farmer				x	School	F	48
25	Pham Quang Vinh	IOE	x			Hanoi	Energy		x			B.Sc	M	46
26	Bui Quang Vinh	NEFSPC-FSIV	x			Vinh Phu	Forestry		x			Diploma	M	43
27	Nguyen Dinh Vong	MARD	x			Hanoi	Forestry				x	B.Sc	M	42
28	Le Oanh Vu	ARDD	x			Daklak	Forestry				x	B.Sc	M	36
29	Nguyen Van Vu	ARDD	x			Son La	Agriculture				x	B.Sc	M	45

T : Training      R : Research  
E : Education    M : Management

## 4.6. Appendix 6: Field Visit Sites

Participants were divided into three groups with representatives from various sectors and levels in each group. The day before travelling to the field sites, the worksheet (below) was presented to each of the participants to help them organize their findings.

	Production and utilization	Marketing	Extension and support services (extension, credit, policies)
Current situation			
Constraints and issues			
Possible solutions			

Sites visited were related to fuelwood production from plantations, fuelwood utilization in small-scale industries and fuel wood trade.

### A. Experimental fuelwood plantations in Vinh Phu province

The first site visited was the North East Forest Science and Production Centre, Vinh Phu province, approximately 50 km from Hanoi. The area of woodfuel plantation is nearly 600 ha, the soil here being very poor. The participants viewed various experimental plantations, such as: pure *E. Tereticornis* plantation, pure *Pinus Caribeae* plantation, mixed plantation of *E. Tereticornis* and *A. Mangium*, mixed plantation of *P. Caribeae* and acacia etc. with different densities and found that *P. Caribeae* is the most suitable in this location. Most of the above were sold for paper manufacture because the price is higher than for fuel; only twigs and branches are used for fuel. In general, the fuelwood price is increasing (In 1993 the price was 300,000 VND/ton, now it is 350,000 VND/ton). The people must now collect dead leaves and fern for fuel.

### B. Long Bien dyeing workshop in Hanoi

The second site visited was the Long Bien dyeing workshop in Hanoi city. This is a private workshop with 30 employees. It consumes 2 tons of fuelwood per day. The price of fuelwood delivered to the workshop is 380,000 VND/ton and the fuelwood is supplied by middlemen. Production is 10,000 meter of cloth per day. There are 5 workshops of the same size and 10 smaller ones in Hanoi.

### C. The steel wire workshop in Hanoi

The third site visited was a private workshop in Hanoi producing steel wire from mild steel rods with 4-8 mm in diameter. The workshop employs 30 persons. The steel wire manufacturing process consumes 40 tons of fuelwood per month. Fuelwood is supplied by middlemen at a price of 380,000 VND/ton at site. Production is 100 tons of steel wire per month. There are 4 workshops of the same size in Hanoi.

#### **D. The fuelwood trading site in Hanoi**

The last site visited was the woodfuel trading site in Thanh Tri district, a suburb of Hanoi. One of the middlemen (a woman) was invited to attend the training course as a participant. She provided useful data on fuelwood production resources and trade. This area consists of one of the biggest markets in Hanoi. Fuelwood comes here mainly from the North-East provinces (Hoabinh, Sonla etc.) by trucks in the form of roundwood. Cutting and splitting are organized by the middlemen. The price of fuelwood depends on species, whether the buyer requires transport or not, distance etc.

## **4.7. Appendix 7: English Language Summaries of Papers and Case Studies Presented**

### **A. The Role of Fuelwood in the National Economy, Mr. Vu Long, FSIV**

Vietnam is a developing country. It is now in the stage of being transformed an essentially agricultural economy to an industrialized and modernized one. In recent years the growth rate of the economy was high (about 8.5%) but Vietnam is still a poor country. As regards energy production and consumption per capita, Vietnam is one of the lowest ranking countries of the world. Energy spent in daily life accounts for a high percentage of the total (about 60%).

Fuelwood has been used in Vietnam for a very long time in all regions of the country, for daily life, and for handicraft and industrial production. As the economy has developed, the structure of energy production and consumption has changed. However, up to now biomass consumption in general and fuelwood consumption in particular still play extremely important roles in the national energy balance. Results of a preliminary study show that biomass energy accounts for 60-70% of the total primary energy consumed in the whole country and fuelwood accounts for over 30-40% of this.

Fuelwood is mainly consumed for household chores heating, livestock keeping (over 90%), and about 10% is used for handicraft production. It can be said that biomass energy in general and fuelwood in particular is the energy of rural and mountainous regions which 80% of the population of Vietnam inhabit.

Energy forecasts till the year 2010 indicate that there will be no remarkable change in the roles of biomass and fuelwood energy.

Fuelwood is exploited from natural forests, forest plantations and dispersed planted trees. At present the overwhelming majority of fuelwood is exploited from natural forests (about 30 million cubic meters per year). The area of natural forests in Vietnam is about 9 million hectares. Although the potential of fuelwood production is great a comparison between the potential and the fuelwood energy actually exploited reveals that the forest capital has been so far been over-exploited, resulting in a decreased area of natural forests and forest deterioration (the loss of forest area is about 100,000 - 120,000 ha/year). The ecological environment of the entire country in general and of the mountainous regions in particular is badly affected.

The movement of dispersed trees planting has spread nationwide, with 400 million trees being planted each year, contributing an important part to the solution of the fuelwood energy problem in the plains and mountainous regions.

Fuelwood is also used wastefully as people still mainly make use of traditional cooking stoves and cooking ranges with low heating efficiencies of about 11-13%.

Fuelwood holds an important position in people's daily lives and production activities but the issue of fuelwood is not yet given due consideration in national energy policies. This situation must be changed as soon as possible.

### Perspectives on fuelwood policy

- ! Solution to the fuelwood problem would solve an urgent problem concerning 80% of the population of Vietnam and, increase employment in rural areas.
- ! Promoting fuelwood production to satisfy demands should carefully balance forest resource development and protection of the ecological environment.
- ! Rational exploitation of natural forest resources and existing vegetation cover would prevent illegal and/or unsustainable forest exploitation.
- ! Promoting forest plantations, dispersed tree planting and the planting of fast growing trees would increase fuelwood supply from forest plantations.
- ! The opening of a fuelwood market should be encouraged to improve its efficiency.

### Recommendations

- ! Effective implementation of national programmes on forest development, including programmes on forest protection and special-use forests, and a programme to develop 2 million hectares of economic forest in the period 1996-2005.
- ! Increase the establishment of dispersed trees planting, forest gardens and forest farms.
- ! Enhance extension work and promote research to improve fast growing tree species and techniques of intensive forest management, to increase forest plantation productivity, and to develop more efficient types of cooking ranges and cooking stoves.
- ! Give trading of fuelwood from forest plantations tax exemption status or at least reduce relevant taxes.
- ! Develop national programme on improved stove extension.

### **B. The Role of Fuelwood in the Daily Life and Socio-Economic Development in the Northern Mountain Highland Provinces of Vietnam, Doan Bong, FSIV**

#### General information

The role of fuelwood is not only very important in daily life in Vietnam but also in many other developing countries in Asia and elsewhere in the world.

According to recent forecasts if we have to supply 1 kg firewood per person per day up to the year 2000, total firewood consumption would amount to 29 million TOE/year. So, to protect forest resources and improve the environment it is necessary that energy be used wisely, especially wood energy.



Fortunately various international seminars, workshops and training courses at regional or national level have been organized and supported by FAO and other international organizations to exchange relevant information and, provide knowledge as well as research results on energy matters in each country, and thus the chances of using energy wisely are better today than in the past.

#### Introduction to the northern mountain highland provinces of Vietnam

This area is one of 8 socio-ecological areas of Vietnam and, includes 8 provinces along the border with China in the north and R.P. Laos in the west.

Its topography is extremely mountainous and in fact the highest point in the country is found here. There are numerous ethnic minority groups living there, each with their own unique customs.

Average temperature is lower than in other areas. In winter the average is about 16°C, but in some months the temperature is much lower (about 2-3°C) and it might snow.

The infrastructure of the area is very poor and considerable investment is needed for roads, an airport etc.

The population density is about 73 person/sqkm. Total forest area is about 16% of the country, but most of the forests are in a poor condition. Some lower provinces, like Cao Bang and Son La comprise only 9 to 10% of forest only.

#### Energy consumption in area

As in other mountain areas of the country the two main sources of energy consumed by people here are commercial and biomass sources.

The commercial source includes coal, oil products, natural gas and electricity. Some energy has to be imported from other areas but it is sufficient only for the transportation industry and a few other industries. The biomass source includes fuelwood, residues and charcoal. But fuelwood is the main source. The potential fuelwood supply from three main sources, namely natural forests, forest plantations and scattered trees mainly in homegardens, has been investigated. According to data on household and industry energy consumption the energy consumed in the area amounts to about 3.69 million tons of wood and 1.03 million tons of residue. Demand for energy is about 0.79 ton of wood and 0.26 ton of residue per capita per year.

Supply sources of fuelwood consisting of natural forests, forest plantations, vegetation on bare hills and wood and agriculture residues of the area provide about 3.4 million tons of wood per year and 1.8 million tons of residue per year.

#### Fuelwood demand and supply balance

According to calculations on woodfuel demand and supply, this area had a woodfuel deficit of about 299,000 tons. But there are more than 1 million tons of residues which can be used as fuel.

## Measures to achieve a balance between fuelwood demand and supply

### *Strengthen supply sources*

- ! Government policies to protect natural forests, such as allocating land to farmers currently encroaching these areas.
- ! Government support to those establishing forest plantations such as providing food, improving living conditions, and providing financial assistance.
- ! Technology transfer to farmers such as high quality seeds, seedlings, intensive culture methods such as those for sloping land, fertilizer etc.

### *Reduce fuelwood demand*

- ! Reducing the population growth rate.
- ! Substituting biomass sources by other energy sources.
- ! Practice thrift in use of fuelwood such as by using improved cookstoves, increasing fuelwood price, tax policies to practice thrift in use of fuelwood.

## Conclusions

- ! The role of fuelwood is very important for people living in this area.
- ! Main fuelwood source is natural forests but forest cover in this area is very low only 19.7%. Forest plantations are still scarce.
- ! It is very necessary to develop suitable policies and good management methods to strengthen fuelwood supply sources and reduce fuelwood demand and consumption.

## **C. Woodbased Industrial Commercial Activities and Their Contribution to the National Economy, Luu Tin, FSIV**

This paper has been prepared mainly on the basis of documentation related to the following:

- ! Tropical forestry action plan of Vietnam.
- ! National energy policies of Vietnam.
- ! Fuelwood production in the different ecological zones project VIE/86/027.
- ! Seminar on science and technology of fuelwood.
- ! Statistical data of the agriculture, forestry and fishery sectors.
- ! French-Vietnam symposium on energy planning, training and cooperation.
- ! Evaluation of the potential, the actual exploitation and utilization of the fuelwood from natural forests in different regions of Vietnam.
- ! Fuelwood energy and ecological balance.
- ! The possible contribution of petroleum products to the energy market in Vietnam.
- ! Forestry and environmental sustainability.

## General introduction

After pointing out the characteristics of the climate, population, the territory and the forests of Vietnam as well as the use of biomass energy in the different regions of the country productivity figures of wood, woodfuel, bamboo in different regions were presented. A preliminary energy balance showed that biomass energy accounts for about 74% of the total energy consumed in Vietnam. Household activities account for 90.5% of the total amount of biomass energy consumed, 46% of this is woodfuel and the remaining 54% includes various kinds of agricultural residues.

Wood to meet the energy needs of the people is exploited as follows: 47.17% from natural forests, 32.7% from planted forests, and 20.16% from scattered trees. Biomass energy consumption for processing agricultural products, foodstuffs and building materials depends on the level of development of these economic sub-sectors in the different regions of the country.

## Socio-economic aspects of biomass energy

This section covers the following topics:

- ! The role of biomass energy in daily life, especially in the large rural areas.
- ! The role of biomass energy in handicraft production agricultural product processing, creating jobs for rural people in order to promote traditional goods production.
- ! The socio-economic problems associated with the biomass energy supply for the urban population and with the urbanization in general.
- ! The price of woodfuel energy and charcoal in the region.
- ! The demand forecast for woodfuel (according to the author this will be 36 millions m<sup>3</sup> by the year 2000).

In order to improve biomass energy supply and production the author states that it is necessary to combine the biomass energy supply with tree planting programmes, as well as afforestation and natural forest management. Moreover, it is important to promote the national utilization of forest industry waste by using it to substitute for wood where possible. The agricultural residues and perennial plants are estimated at 3.5 million tons, which amounts to 84% of the total amount of non-wood residues and should be rationally used.

There are three main issues that need to be addressed to ensure the sustainability of energy supplies and the ecological balance.

- ! Energy economy issues
  - The need to improve the efficiency of the kitchen stove.
  - The need to limit the harmful effects of smoke on the health of the women working in the kitchen.

According to the author's figures biomass residues amounted to 4.6 million tons, corresponding to 31.6 million tons WE.

! Woodfuel supply issues

Two major factors which determine the consumption of biomass energy are as:

- The cost of the available energy sources
- The sources available for each family.

Industrial development will attract rural residents to the industrial centers and consequently the demand for biomass energy will increase. This situation could cause the depletion of forest and vegetation cover and face the population with the threat of fuel shortages.

! Woodfuel energy development issues

The main issues here are:

- The need to establish programmes for sustainable management and improvement of forest cover.
- The need to improve the exploitation and breeding techniques by applying energy economic principles. National programmes on woodfuel afforestation and land allocation and forest policies should be established in order to meet the demand for 40.9 million tons of WE biomass energy.

Conclusion and recommendations

Biomass energy plays an important role in the daily life of the rural population and the author shows that Vietnam is faced with many difficulties related to satisfying the demand for biomass energy.

The following recommendations were made:

- ! Appropriate policies to promote afforestation, the exploitation and distribution of biomass energy, and the production of charcoal and their preliminary thermotreated material.
- ! Assistance should be given to people producing biomass energy.
- ! The relevant infrastructure should be improved and strengthened.
- ! Training courses on woodfuel production and utilization should be organized.
- ! Appropriate measures should be introduced to raise awareness of the people to improve the efficiency of biomass energy supply and the progress toward ecological sustainability.

**D. Fuel Production from the Agriculture - Based Sector at Farm - Household Level, Including Woodfuel Production from Scattered Tree Planting on Non-Forest Areas, Dau Quoc Anh, VASI**

Agriculture - based woodfuel is an important source of energy in Vietnam and often the only source accessible to rural people. Although accurate data are not available, a very large part of the population, probably two thirds of the total population of the whole country, depend on wood fuel and agriculture residues and scattered tree planting on non-forest areas to satisfy their domestic energy needs. Furthermore, agricultural - based woodfuel is also an important source of energy for many industries, located mainly in rural areas, where they provide employment and/or off-farm income to a large number of people, including women. The dependency on agricultural - based fuel is likely to continue for some time, even with accelerated economic development, because alternative energy sources will be either too costly for the poor or not widely available in rural areas.

No satisfactory assessment of the agriculture based woodfuel situation in Vietnam is available, as may be judged from demand estimates quoted in recent literature, which range widely from 35-60 million cubic meters per year and indicate an increase to 40-100 million cubic meters by the year 2000. The agricultural based supply situation is also unclear. Simple observations, however, have indicated that in many rural areas, people are facing acute fuel shortages, resulting in the increased use of agriculture residues, bushes and leaves for fuel. The scarcity may imply that more time and effort is required to collect fuel and thus limit the time spent on other production activities. The use of less preferred fuels like paddy straws and leaves creates difficulties in cooking.

1. Fuel production from agriculture and agriculture - related sources

*Scattered trees*

Scattered trees can be considered an agricultural or forestry source of fuel production. This includes plantings of individual trees, mainly in home-gardens, in crop lands, especially in agroforestry plots, along farm boundaries, roadsides, canal banks and other marginal lands. The major tree resources are planted for a wide variety of uses including the production of fruit and timber (mainly poles and other on-farm utility materials), fuelwood and fodder. They are also planted for shade and for soil protection from erosion.

In 1994, 500 million trees were reported to have been planted which is equal to 0.5 million ha at 1000 trees/ha equivalent. To estimate the sustainable fuelwood supply it is assumed that the mean annual increment would be as valid for forest plantations (10m<sup>3</sup>/ha/year) but would yield a lower amount of 2m<sup>3</sup>/ha/year on an area equivalent basis. Thus the contribution of 4 million ha of scattered trees is estimated to be about 8 million tons of firewood per year which is expected to increase in the coming years.

## Perennial crops

The main tree crops of interest for the production of biomass are rubber, tea, coconut and coffee, all of which can provide firewood by the end of their harvesting cycles. Currently, the area under these tree crops are as follows: rubber 225,000 ha; coffee 123,000 ha; tea 60,000 ha; and coconut 220,000 ha. Annually, the area under rubber increases by 5000 ha. The biomass wood yield reaches 30 m<sup>3</sup>/ha/year and total woody output can provide 0.5 million m<sup>3</sup>, equivalent to 0.35 million tons yearly. The rubber wood can be used for various purposes without the need for processing and is considered a good fuelwood source. Coconut trees are mainly planted in Southern Vietnam in home gardens. Their stems, leaves, fiber, and shells are used as fuel. Annually about 0.5 million tons of coconut residues are produced as a sustainable fuel source.

Coffee trees are also mainly grown in Southern Vietnam, especially in the Western Highlands. The area under coffee in 1994 was 123,000 ha. At the end of their production cycles the coffee trees (mostly *Canephora robusta*) provide a significant source of fuelwood (20-30m<sup>3</sup>/ha). Annually, coffee trees supply about 0.5 million tons of fuelwood.

## Agricultural residues available as fuel source

In 1994, agricultural residues were as follows (000 tons):

Rice straw (55% of vegetative output)	22,800
Rice husks (28% rice output)	5,000
Maize stems and leaves (50% of vegetative output)	700
Cassava stems (50% vegetative output)	2,500
Sugarcane residues (28% of vegetative output)	5,700
Sweet potato residues (20% of vegetative output)	700
Other agri-residues	600
	-----
Total:	38,000

These agricultural residues contribute about 50% of the fuel used in the countryside and the output of scattered trees contributes an increasing amount to the supply of biomass, sharing about 20% of the total national fuelwood demand.

## 2. Main constraints on agricultural - based fuel production

Currently, Vietnam is one of the developing countries where large amounts of biomass fuel from agriculture are used at household level.

The production of these biomass fuel sources face numerous serious constraints, including:

- ! Agricultural residues and scattered tree planting, the main sources for fuel in rural areas, are produced on an unplanned manner and unsustainably, and depend on the ad hoc decision of each farm household.
- ! Rice straw, the main source of fuel in the delta, is not very suitable as domestic fuel since it produces too much smoke.

- ! Some of the agricultural residues are not available for use as fuel, partly because they are generated seasonably, partly because they are burnt in the field as fertilizer or used for other purposes. In general, out of the 38 million tons of agricultural residues generated, probably around 50% is available as a source of energy.
- ! Most regions show fuelwood and residues deficits, when the present demand is compared with the estimated supply, and thus additional supplies are necessary. In most areas of the country, there is a dependency on residues as an energy source which may have implications for soil fertility and farm productivity. Additional energy sources like conventional energy or woodfuel may have to be increased.
- ! There appears to be little policy guidance and no focus by way of specific objectives and strategies on biomass fuel production.
- ! Lack of accurate information/data on agricultural - based fuel source production, consumption and marketing.

### 3. Perspectives and recommendations

The use of agricultural residues accounts for about 50% of the biomass fuel used. This may contribute to fertility loss and even land degradation. The extent to which it makes such a contribution is not known, but it is of concern to the long-term goal of development. However, there is a variety of practical and economic considerations which may prevent farmers from doing what, in strict soil scientific terms, would be the best. Firstly, plowing under straw is not a simple task and secondly, some crop residues, notably rice husks, decompose so slowly as to be of little nutritional or structural benefit to the soil.

In practice, most farmers remove residues from the field and use them for other purposes such as animal feed, litter fuel or even sell them in biomass deficit areas.

It also appears that virtually no systematic work has been done to document the trade-off between different residues uses at a village/hamlet level. Very little is known about how farmers themselves see the trade-off involved. Since farmers themselves (after the "àoií muái" renovation) make the decision on how residues are to be used, and they bear their consequences, their views should also be taken into account. There may thus be a need for more basic research in order to analyze the overall implications and to reach conclusions beyond a theoretical and largely abstract discussion. It is recommended to continuously update the information on biomass energy availability. Detailed assessment of the potential for fuelwood production from scattered trees in home gardens, farm lands and other areas, especially on bare land should be carried out. A greater focus on agroforestry models may also be considered in the land allocation process in order to maximize household incomes in rural areas. This approach should be encouraged though major donor support which may require more innovations and pilot studies. Among others, scattered tree planting on bare-lands, conducted by farm households is increasingly important and it should receive more assistance and support from agricultural-forestry research and extension systems.

## **E. The role of Non-Forest Areas in Woodfuel Production in Vietnam, Nguyen Thi Quy, IOE**

### 1. General

In general, woodfuel accounts for more than 30 per cent of the total energy consumed in Vietnam. This kind of energy is supplied from various sources with non-forest areas providing more than 70% of the total.

#### *Fuelwood from bare land*

Statistical documentation provided by the forestry department and the evaluation of energy experts indicate that the sustainable fuelwood supply from this area in 1990 amounted to approximately 4 millions tons (0.5 t/ha/year). Assuming that this area is reforested, the above supply would increase by four or five times.

#### *Fuelwood from scattered plants*

Scattered trees in Vietnam are considered an important fuelwood resource from non-forest areas. During the period from 1961 to 1992 farmers and other rural people throughout the country planted 6.5 billion scattered trees of different species, which is equivalent to 6.5 million planted hectares. A considerable number of planted trees could be used for non-energy and energy purposes. Until now, 4 billion planted trees remain. The survey conducted in 1990 shows that the quantity of fuelwood collected from scattered trees was about 8 million tons.

#### *Fuelwood from perennial plants*

Perennial plants such as tea, rubber, coconut are also considered a fuelwood source. The fuelwood generated from these plants accounted for approximately 0.78 million ton.

Residual fuelwood from the wood processing and construction industries.

Primilinary evaluation conducted by FAO specialists indicates that the residual wood obtained from the wood processing and construction industries amounted to 1.6 million tons and 0.6 million tons respectively.

### 2. On-going forestry and agricultural extension programmes

These consist of two main types:

- ! Various reforestation and plantation programmes have been carried out during the last few years such as promoting plantations in denuded hill areas and supporting reforestation and agricultural programmes. These programmes have been intensively encouraged and supported by the governmental and ministerial institutions of Vietnam.
- ! Programmes fully or partly financed by international organizations such as PAM, UNDP/FAO, World Bank, etc.



It is expected by the year 2000, the number of planted trees will reach 6.5 billion and all of the bare land will be reforested.

### 3. Issues and constraints

These are numerous and varied, and include:

- ! Limitation of cultivated land in the plains provinces.
- ! Limitation of funds and delays in financing.
- ! Lack of support for forest preservation and plant protection from different levels of authorities, and state organizations.
- ! Existing custom of non-fixed residence and cultivation of people living in mountainous areas.
- ! Lack of updated statistical data and information in this field.

### 4. Integration of wood and woodfuel production

It would not be economical if the objective of plantations was to obtain fuelwood only, therefore plantation programmes undertaken in Vietnam aim to generate wood, fruit, flowers, seeds and, of course, fuelwood. Experience obtained so far and the evidence of economic analyses suggest that the appropriate ratio between fuelwood and generated income from a non-forest and, plantation is 20:80.

During the period 1991-1995 the annual increase in plantations and scattered plants is estimated to have been 100,000 ha and 260,000 ha respectively. This resulted in an overall increase in fuelwood production of 20% compared with that in 1990.

### 5. Conclusion and recommendations

The government of Vietnam and various international organizations have made great efforts to finance and invest in technical improvements for plantations and for generating fuelwood in general. Various programmes have been successfully implemented, but the results of these have not been satisfactory. The limitations and constraints on these efforts to increase fuelwood supplies should be overcome as soon as possible in order to meet the country's increasing household energy demand.

## **F. The Fuelwood Market in Vietnam, Nguyen Duy Thong, IOE**

### Introduction

Fuelwood is an important source of energy in Vietnam, especially in rural areas, where nearly 80% of the total national population resides. However, a fuelwood market hasn't developed in rural areas as farmers can go to the forest and freely gather as much as they wish. The fuelwood market in Vietnam is concentrated in cities and towns and has changed through time as a result of the country's socio-economic development.

Studying and evaluating the fuelwood market are necessary and urgent tasks so that appropriate strategies and policies for national energy development can be formulated, a healthy fuelwood market can be created and farmers' living standards in rural areas can be improved. However, such tasks will no doubt encounter many difficulties.

### Fuelwood and biomass energy

The results of studies show that fuelwood and biomass energies (leaves, grasses and agricultural residues) account for about 60-70% of the total national primary energy consumed. It is estimated that in the next 10-20 years fuelwood and biomass energy will still play an important role in the national energy balance.

The main consumers of fuelwood and biomass energy in Vietnam are:

#### Households and services

Households and services (cooking, pig feeding, heating, restaurants are the biggest fuelwood and biomass consumers in Vietnam. According to one survey, the average amount of fuelwood and biomass energy consumed per capita was about 510-530 kg of wood equivalent/year

#### Small rural industries

Brick, tile, and pottery industries are the biggest consumers of fuelwood and biomass energy in the small rural industrial sector in Vietnam.

#### Agricultural processing

Although detailed statistics describing the amount of fuelwood and biomass energy consumed by agricultural processing are not available some figures and calculations show that regular activities such as producing cake, noodles, soya cake, alcohol and sugar manufacturing, drying tea, tobacco and coffee etc. consume a large proportion of it.

Proportions of fuelwood and biomass energy used by various sectors in Vietnam in 1994 are shown below in table 1.

*Table 1: Use of fuelwood and biomass energy in Vietnam, 1994.*

Sector	Percentage (approx.)
Households and services	91
Small rural industries	4
Processing	5

Total use amounts to approximately 14,5.106 TOE.

Supply sources of fuelwood and biomass energy are presented in table 2 along with the annual yield for each source.

*Table 2: Supply sources for fuelwood and biomass energy and annual yields.*

Supply sources	Yield (103T/year)
Fuelwood (including)	20,080
* Natural forest	* 2,588
* Plantations	* 2,209
* Degraded forests	* 4,233
* Scattered trees	* 8,096
* Wood processing	* 1,577
* Others	* 1,381
Agricultural residues	34,977

Source: Fuelwood and energy sectoral review in Vietnam, A. Koopmans, FAO, Bangkok, 5/1992

#### Fuelwood supply flows

There is no currently available clear picture of the fuelwood market in rural areas in Vietnam. But the following general features or characteristics have been identified:

- ! The fuelwood market is concentrated in different sized urban areas.
- ! The fuelwood market in the North is smaller than that of the South.
- ! The country's largest fuelwood market is in Ho Chi Minh city.
- ! The fuelwood market is effected by the common energy market.
- ! Before 1990 the fuelwood market was mainly controlled and supplied by the government and state enterprises.
- ! From 1990 to the present the fuelwood market has been managed by the private sector and in fact it is not controlled.
- ! It is estimated that about 4-5 million tonnes of firewood, or about 20-25% of the total firewood produced annually is traded in the market.

#### Fuelwood market structure

- ! Marketing chain
  - Middlemen
  - Agents
  - Wholesalers
  - Retailers

The sale of fuelwood usually takes place on market days.

! Sellers

These consist of:

- State enterprises
- Collectives
- Groups
- Individuals.

! Market places

There include:

- Yards around the cities or towns.
- Wholesale and retail stores on the streets.
- Fuelwood stores open on market days and located in the market area.

Factors effecting the fuelwood market

- ! Recent development of the national common market and the energy market.
- ! The national economic development, and the improvement in the people's living standard.
- ! The change in fuelwood sources.
- ! National commercial energy price changes.

Fuelwood price

In Vietnam the price of fuelwood doesn't reflect its true value. Rather it only reflects labour expenses (felling trees and cutting them into manageable sizes), transport costs and services costs (splitting fuelwood into small pieces, bundling, delivery, etc.), but excluding all the taxes. At the same time the fuelwood price in the urban areas is double or quadruple that in the rural areas. The ordinary fuelwood price in Hanoi was 350-500à/kg in March, 1996.

Substitution of woodfuel

The Vietnamese government would like to reduce the fuelwood deficit, especially in urban and crowded areas. Coal, kerosene, LPG, and electricity have been used to substitute fuelwood and biomass energy. From 1990 to 1995 about 2-2.5 million tonnes of coal were used to substitute 3.5-4.5 million tonnes of woodfuel each year.

## Conclusion

Fuelwood and biomass energy play important roles in Vietnam, however problems facing these sources are still not given serious attention. Planning for fuelwood and biomass energy development is not treated separately but is incorporated into the national energy planning development or socio-economic development in rural areas. Studies to identify the right condition to develop a healthy fuelwood market are urgently required.

### **G. Establishment of Experimental Fuelwood Plantations and Fuelwood Use in the Ngoc Thanh Area, Melinh District, Vinh Phu Province, Dao Vu, NEFSPC**

#### Part I: General situation of Ngoc Thanh Commune

A general description of the area's physical conditions is given, including its:

- ! Geographical situation
- ! Climatic and hydrological conditions
- ! Land resources

The total area of Ngoc Thanh commune is 9,000 ha of which 4,200 ha are forested.

The commune consists of 1,632 households with a population of 8,300. The San Diu ethnic group makes up 50%, of the population and the remaining 5% is made up of the Kinh ethnic group.

The living standard of the people is low with a mean income of 250 kg of rice/person/year.

#### Part II: results of the experimental firewood plantations

Experimental firewood plantations have been established for 20 years. These have involved planting 600 ha with pines, acacias, eucalyptus and other leguminous tree species.

Research work on these experimental firewood plantations has been carried out on hundreds of hectares with various planting regimes such as: pure *E. Tereticornis* plantation, pure *Pinus Caribaeae* plantation, mixed plantation of *E. Tereticornis* and *A. Mangium*, mixed plantation of *P. Caribaeae* and acacia etc. Different planting densities have also been tried ranging from 10,000 trees/ha to 1,650 trees/ha.

The results of the research show that mixed planting in rows (one row of *E. Tereticornis*, one row of acacia or two rows of *E. Tereticornis*, one row of *A. Auriculiformis*) with a density 2,500 trees/ha-3,300 trees/ha leads to a highly productive firewood plantation. Although a *P. Caribaeae* plantation is the most productive its rotation is longer than that of other planted species.

### Part III: Fuelwood use in the locality

The fuelwood demand in this area is particularly heavy. Fuelwood is not only used in the construction industry but in various local industries and for daily cooking in each household.

Ngoc Thanh commune alone requires annually 1,000 m<sup>3</sup> of fuelwood and timber for construction of houses, stables for domestic animals and for making tools.

Industries manufacturing paper, bricks and roof tiles, chopsticks, packing boxes in this locality also require a great quantity of fuelwood. The consumption of firewood for cooking is especially great. The 8,300 people of Ngoc Thanh commune alone require annually 27,666 steres of firewood for cooking. Therefore the amount of fuelwood from fuelwood plantations as well as from natural forests does not meet the requirements. The people must make the most of whatever is available such as dead leaves in the forests and plantations, *R. Hodonyrtus tomentosa*, *Melastoma candidum*, *Diasnopteris linearis* for fuel.

The imbalance between supply and demand causes the price of fuelwood to keep increasing. The price of 1 stere of firewood in 1993 was 60,000à (Vietnam currency), now it is 90,000à. The price of 1 stere of pine timber in 1993 was 65,000à now it is 120,000à. The price of 1 stere of eucalyptus fuelwood in 1993 was 50,000à now it is 80,000à. The price of 1 stere of pine fuelwood in 1993 was 30,000à now it is 55,000à.

We can see therefore that the State as various well as international organizations need to pay more attention, both financially and technically to investing in the development of the forestry sector.

There needs to be policies encouraging and supporting poor people to make gradual use of such fuels as coal, gas, and electricity to replace firewood.

#### 4.8. Appendix 8: Photographs Illustrating the Training Course



*Dr. Ha Chu Chu, Director of FSIV, reading the welcoming speech.*



*Mr. Bhattarai, RWEDP representative, introducing the training course.*



*Some of improved stoves.*



*A woodfuel plantation model.*





*Collecting fuelwood from forest plantations and bare hills.*



*Fuelwood for manufacturing steel wire and dyeing cloth.*