Final Technical Report No. 2

Making Skilful Manpower Available for Development of Wood-based Biomass Energy






ITTO Project PD 737/14 Rev.2 (I)

Developing Supply Capacity of Wood-Based Biomass Energy
through Improved Enabling Conditions and Efficient Utilization of Degraded Forest Lands
involving Local Communities in North Sumatra Province of Indonesia

Jakarta, November 2021

The Ministry of Environment and Forestry of Indonesia (MoEF)
Directorate General of Sustainable Forest Management (PHL)
Directorate of Production Forest Development (UHP)
Indonesian Sawmill and Woodworking Association (ISWA)
The International Tropical Timber Organization (ITTO)

Final Technical Report No. 2

ITTO Project PD 737/14 Rev.2 (I)

Developing Supply Capacity of Wood-Based Biomass Energy through Improved Enabling Conditions and Efficient Utilization of Degraded Forest Lands involving Local Communities in North Sumatra Province of Indonesia

Making Skilful Manpower Available for Development of Wood-based Biomass Energy

Prepared for the Project by:

Mr. Jimmy Chandra, Project Coordinator
and
Dr. Hiras P. Sidabutar, Project Management Advisor

Executed by:

Directorate of Production Forest Development (UHP)
Directorate General of Sustainable Production Forest Management (PHPL)
The Ministry of Environment and Forestry of Indonesia (KLHK)

In collaboration with:

The Indonesian Sawmill and Woodworking Association (ISWA)

With the assistance of:

The International Tropical Timber Organization (ITTO)

Jakarta, November 2021

Project Title	: Developing Supply Capacity of Wood-Based Biomass Energy through Improved Enabling Conditions and Efficient Utilization of Degraded Forest Lands Involving Local Communities in North Sumatra Province of Indonesia
Serial Number	: PD 737/14 Rev.2 (I)
Executing Agency	: Directorate of Production Forest Development (UHP) of PHPL Manggala Wanabhakti Building Block I Floor 5, Jl. Gatot Subroto, Senayan, Jakarta Phone number: 62-21 503265 Ext. 242 hutantanaman@gmail.com
Collaborating Agency	: Indonesian Sawmill and Woodworking Association (ISWA) Manggala Wanabhakti Building Block 4 Floor 8, Jl. Gatot Subroto, Senayan, Jakarta Phone number: 62-21 5733018, 5703172 e-mail:iswapusat@gmail.com

Project Key Personnel

- Project Coordinator : Mr. Jimmy Chandra
- Project Secretary : Ms. Richma Wahyuni
- Field Supervisor : Mr. Alamsyah/ Mr. Dedi Agape
- Project Finance : Ms. Herlina Lesmana
- Management Advisor : Dr. Hiras Sidabutar

Published by : PHPL, ISWA and ITTO
Place and date : Jakarta, November 2021

List of Abbreviations and Acronyms

ANFRI	Aek Nauli Forestry Research Institute
APHI	Asosiasi Pengusaha Hutan Indonesia (Indonesian Forest Concession Holders Association)
ATIBT	Association Technique Internationale Des Bois Tropicaux
CIFPT	Centre for International Forestry Products Trade
CTWPDA	China Timber and Wood Products Distribution Association
EFD	Energy Forest Development
EFP	Energy Forest Plantation
FMU	Forest Management Unit
GGSC	Global Green Supply Chains
GoI	Government of Indonesia
IPPC	International Plant Protection Convention
ISWA	Indonesian Sawmill and Woodworking Association
ITTO	International Tropical Timber Organization
KLHK (MoEF)	Kementerian Lingkungan Hidup dan Kehutanan (Ministry of Environment and Forestry)
LSSC	Legal and Sustainable Supply Chain
MoEMR	Ministry of Energy and Mineral Resources
NFGA	National Forestry and Grassland Administration of China
PHPL	Pengelolaan Hutan Produksi Lestari (Sustainable Production Forest Management)
SFM	Sustainable Forest Management
UHP	Usaha Hutan Produksi (Production Forest Development)
UNFCCC	United Nations Framework Convention on Climate Change

Table of Contents

Summary

The specific objective of ITTO Project PD 737/14 Rev.2 (I) was to improve enabling conditions for building up capacity to supply wood-based biomass energy in North Sumatera region; it was planned to be achieved through delivery of three outputs, one of which was “Skilful manpower for development of wood-based biomass energy available”. In order to deliver this particular output, five activities were planned to be implemented, namely:

- Activity 2.1 : To conduct dialogue with local communities on benefits of energy forest development
- Activity 2.2 : To Train local communities on technical skills for energy forest development covering production of planting materials, planting, tree nursing and harvesting techniques
- Activity 2.3 : To train local communities on village cooperative management to support energy wood business development
- Activity 2.4 : To conduct comparative studies on wood-based energy development
- Activity 2.5 : To develop technical manuals for growing gamal, kaliandra and lamtoro for energy wood production.

All five project activities had been fully implemented with results satisfied pre-defined indicators of Output 2 as highlighted below:

- Under Activity 2.1: dialogues with local communities on benefits of energy forest plantation (EFP) had been conducted at 49 villages out of 50 villages targeted; the indicator was, therefore, met 98%.
- Under Activity 2.2: the number of participants in the training program on EFP development techniques was 205 persons as opposed to 100 of community leaders as the training target. The second indicator of the output was satisfied.
- Under Activity 2.3: 35 community leaders were trained on skills for managing village cooperative; 50 community leaders had been targeted to take part in the training. Hence, the indicator was only 70% satisfied due mainly to the covid19 pandemic problem which was categorized as a force majeure phenomenon.
- Under Activity 2.4: 3 comparative studies to unspecified countries had been targeted; 3 comparative studies with 6 participants were realized. The indicator was, therefore, fully met.
- Under Activity 2.5: 3 technical manuals for EFP development using gamal, kaliandra and lamtoro had been planned for formulation and all three manuals had been developed. The indicator therefore was fully met.

Progress in implementation of planned project activities and the extent to which results of the activities satisfied defined indicators of the output clearly indicated that Output 2, as defined above, had been delivered. Quality of the output delivered, however, was questioned due to the fact that indicators of achievement of Output 2 were inadequately defined by reducing the indicators only to wood-energy supply chains.

1. Introduction

1.1. Background Information

ITTO Project PD 737/14 Rev.2 (I): “Developing Supply Capacity of Wood-Based Biomass Energy through Improved Enabling Conditions and Efficient Utilization of Degraded Forest Lands involving Local Communities in North Sumatra Province of Indonesia” had been implemented by Directorate of Production Forest Development (UHP) of Directorate General of Sustainable Production Forest Management (PHPL) of the Ministry of Forestry (MoEF) of Indonesia in collaboration with the Indonesian Sawmill and Woodworking Association (ISWA) since October 2017 based on the project agreement duly signed by the Government of Indonesia (GoI) and The International Tropical Timber Organization (ITTO) in March 2017 and the Memorandum of Understanding on the implementation of the project duly signed by PHPL, the Executing Agency, and ISWA, the Collaborating Agency, on 18 September 2017.

The project was aimed at increasing contribution of the forest sector to renewable energy supply and regional economic development through increased supply of wood-based biomass energy. Its specific objective was to improve enabling conditions for building up capacity to supply wood-based biomass energy in North Sumatera region which was planned to be achieved through delivery of three outputs, namely:

i. Development of sustainable supply of energy wood initiated.
ii. Skilful manpower for development of wood-based biomass energy available.
iii. Investment in wood-based energy industry development promoted.

This report concerns with above-mentioned second output (Output 2) only which would be delivered through implementation of five pertaining activities, namely:

- Activity 2.1 : To conduct dialogue with local communities on benefits of energy forest development
- Activity 2.2 : To Train local communities on technical skills for energy forest development covering production of planting materials, planting, tree nursing and harvesting techniques
- Activity 2.3 : To train local communities on village cooperative management to support energy wood business development
- Activity 2.4 : To conduct comparative studies on wood-based energy development
- Activity 2.5 : To develop technical manuals for growing gamal, kaliandra and lamtoro for energy wood production.

The project proponent hypothesized that the full implementation of above-mentioned five activities will deliver the second project's output. Attributes of delivered output especially in terms of its quantity and quality, however, remain to be assessed.

It is to be noted that this project was formulated in the first place by ISWA in response to the information on national energy market released by the Ministry of Energy and Mineral Resources (MoEMR) of Indonesia back in 2014 which revealed several serious problems, namely: i) the ever growing consumption of energy and sluggish development of supply capacity, ii) high dependence of supply on fossil energy, iii) growing government subsidy on energy overtime, iv) sub-optimal utilization of renewable energies and weak energy conservation program, and v) weak mitigation of climate change relating to energy production and consumption processes.

In its efforts to overcome the national energy problems, the MoEMR decided to implement policies on the supply side that focused on increasing renewable energy share in national energy mix from the current 7 percent to 23 percent in 2025. It was claimed by the government that the forest sector had a great potential to contribute to achieving the targeted share of renewable energy by utilizing available forest resources in a sustainable manner.

1.2. Organization of the Report

This report has been organized, to the extent possible, in accordance with existing ITTO Manual. The first part of the report provides background information on the project particularly on the objectives and deliverables. The second part elaborates on the methodologies applied in implementing individual activities pertaining to Output 2. The data collected or generated and outcomes of individual activities are presented in Part 3 while analysis and interpretation of data and results of the activities are described in Part 4. Conclusions and recommendations are presented in Part 5 while implication for practice is highlighted in Part 6 of the report.







2. Applied Methodologies

The second output of the project to be delivered was “Skilful manpower for development of wood-based biomass energy available”. In order to deliver this output, five activities had been fully executed. The methodologies applied in implementing the respective activities are highlighted in the following sections.

2.1. Activity 2.1: To conduct dialogue with local communities on benefits of energy forest development.

The targeted outcome:

Dialogue on energy forest plantation development implemented involving 50 villages located in 13 districts of North Sumatera province.

The executor

The activity was executed with the assistance of University of Simalungun, located in the city of Pematangsiantar, supported by forestry extension officers of Aek Nauli Forestry Research Institute (ANFRI) and the project field supervisor.

The operational strategy

- The University, in collaboration with the Provincial Forestry Agency, district governments and project field supervisor, developed criteria for selection of target villages;
- In the same manner, the University developed dialogue materials which covered:
  i. Definition of energy forest plantation (EFP)
  ii. The processes and requisites for EFP development
  iii. Potential role of local stakeholders in the development process
  iv. Potential market and benefits of EFP
  v. Potential for producing bee honey from EFP
- To recruit 10-15 villagers from individual selected villages to participate in the dialogues under the condition that around 25% of them were women and girls;
- To organize 13 dialogue sessions, one session in every district, each session participated by 2 to 6 villages depending on village geographical distribution that recruitment cost of the villagers was minimized;
- To compile a technical report on each session and produce a composite technical report on the activity based the individual session reports.

2.2. Activity 2.2: To train local communities on technical skills for energy forest development covering production of planting materials, site preparation, planting and harvesting techniques.

The targeted outcome

- 100 villagers from 50 villages located in 13 districts trained on technical skills for EFP development;
- Recruited training participants were selected from those villagers that had taken part in the previous dialogues on EFP development implemented under Activity 2.1;
- Selection of the participants was accomplished through collaboration of Head of the village, Head of the FMU involved and the Project.

The executor

- To execute the activity, two small local firms had been selected in accordance with existing ITTO's rules and procedures for the selection of consultants and appointed with the prior approval of ITTO;
- The appointed executors of the activity were: UD. Tunas Rimba and CV. Bumi Hijau.

The operational strategy

- The training was carried out at the 3 demo-plots of EFP situated in 3 FMUs, i.e. Simalungun, Humbang Hasundutan and Tapanuli Selatan;
- The training was arranged under 5 modules namely:
  i. Nursery development and production of planting materials
  ii. Land and soil preparation and planting
  iii. Maintenance, covering replacement of died plants, weeding, fertilization, etc.
  iv. Harvesting
  v. Bee honey production using EFP
- The wood energy species used were: gamal, kaliandra and lamtoro;
- Modules 1, 2 and 3 were implemented simultaneously, Module 4 was implemented only at 2 FMUs (Simalungun and Tapanuli Selatan) while Module 5 was carried out only one time at Simalungun FMU;
- The executing small firms were assisted by concerned FMUs, ANFRI expert and the Project;
- To compile a technical report on each of the modules implemented and then combined the reports in one consolidated technical report on the activity;
- Module 4 was implemented only at two sites as Humbang Hasundutan demo plot was considered failing thus was at "no harvest status";
- Module 5 was conducted only at Simalungun site as this training was only an extra work deliberately added to serve as an incentive for farmers to participate in EFP development program.

2.3. Activity 2.3: To train local people on village cooperative management

The targeted outcome

50 village leaders from 50 villages in 13 districts of North Sumatera province trained on necessary skills for establishing and managing the operation of village cooperatives.

The executor

Selected executor was Head of the Koperasi Simpan Pinjam Makmur Mandiri based on competence and experience in dealing with formation and operational management of village cooperative, assisted by his senior staff.

The operational strategy

- Participants of the training were selected from those villagers that had participated in the training on skills for EFP development conducted under Activity 2.2;

- Collaborators of the trainers were Head of Simalungun FMU and its forestry extension officers;
- Training materials were developed by the trainers; and
- Agenda of the training provided high weight to class discussions or Q & A session.

2.4. Activity 2.4: To conduct comparative studies on wood-based energy industry development

The targeted outcome

Three (3) comparative studies to unspecified countries by senior staff of the executing and collaborating agencies of the project conducted.

The executor

- The comparative study to Vietnam was participated by Mr. Istanto and Mr. Hendro Widjanarko of the Executing Agency and Ms. Richma Wahyuni of the Collaborating Agency;
- The comparative study to Ganzhou, China was performed of Mr. Jimmy Chandra of the Collaborating Agency, the Project Coordinator;
- The comparative study to Shanghai, China, was attended by Mr. Istanto of the Executing Agency and Dr. Hiras Sidabutar of the PMU.

The operational strategy

- The Vietnam comparative study was attended by some 17 people in total. In addition to the representatives of the executing and collaborating agencies, the tour was also joined by representatives of the Ministry of Environment and Forestry including Director General of Sustainable Production Forest Management (PHPL) and a few mid-rank staff of his, the Indonesian Forest Concession Holders Association (APHI) and one Head of District government in North Sumatera;
- The comparative study was preceded by an intensive communication and a long process of preparation and it took place on 13-19 May 2019;
- The comparative study to Ganzhou City of China was undertaken based on the invitation by the 4th Global Rubber Industry Development Conference which was extended to include visits to wood furniture industries and to wood processing industries in Jiang Xi province for purpose of wood technology learnings.
- The study to Shanghai was a participation in an International Forum titled “Together towards global green supply chains: A Forest Products Industry Initiative” organized by Chinese Government on 22-25 October 2019.

2.5. Activity 2.5: To develop technical manuals on energy forest development for planting of gamal, kaliandra and lamtoro

The targeted outcome

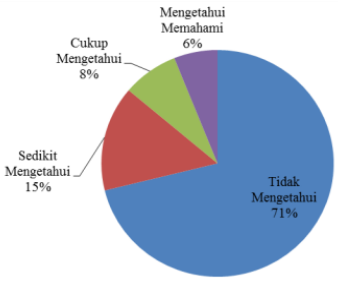
Technical manuals for growing gamal, kaliandra and lamtoro as source of energy wood, ready for distribution and use.

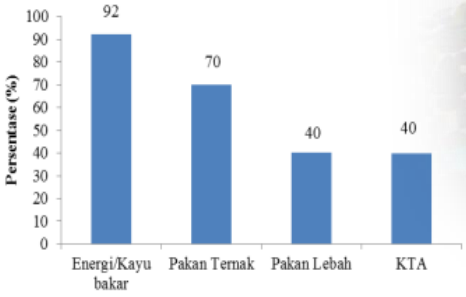
The executor

A competent national consultant, was temporarily hired in accordance with existing ITTO’s rules and procedures for procurement of goods and services to accomplish the task.

The operational strategy

- The manuals were developed using available information on the establishment of the species based on documented experience in different growing sites in Indonesia including experience of ITTO Project PD 737/14 Rev. 2 (I) in growing the species on three different FMUs for purpose of demonstration and training.
- The task was basically a desk work with only a limited amount of field activities.





3. Presentation of Data and Results

3.1. Dialogues on EFP Development with Local Communities

a. Time schedule and participants

The dialogues took place at 49 villages in 13 Districts of North Sumatera province involving 527 villagers in total that consisted of 462 men and 65 women (12.3%) as depicted in Table 1.

Table 1. Venues, dates and participants of the dialogues on EFP

No.	Districts	Dates	No. of Participants		Women (%)
			Villages	Villagers	
1	Simalungun	25-28 Juni 2018	6	54	13
2	Asahan	17-21 Sept 2018	3	45	13
3	Karo	29-30 Juni 2018	4	20	5
4	Dairi	3-5 Sept 2018	3	45	9
5	Pakpak Bharat	6-7 Sept 2018	3	32	9
6	Samosir	5-6 Juli 2018	4	41	10
7	Humbang Hasundutan	16-18 Juli 2018	6	43	12
8	Toba Samosir	2-4 Juli 2018	4	48	23
9	Tapanuli Utara	25-28 Juli 2018	2	46	20
10	Tapanuli Tengah	12-15 Agustus 2018	3	39	13
11	Padang Lawas Utara	18-20 Agustus 2018	3	36	8
12	Tapanuli Selatan	6-8 Agustus 2018	6	48	8
13	Mandailing Natal	9-10 Agustus 2018	2	30	17
	Total/Average		49	527	Av.12.31

Dialog session at Pakpak Bharat, led by Dr. Aswandi, (Photo by PMU)

Dialog session at Karo district (Photo by PMU)

b. Comprehension of the participants on EFP development
Table 2 summarizes results of the dialogues listed in Table 1 in terms of participant's comprehension of definition, process or stages involved, potential roles of farmers and potential benefits of EFP development. To illustrate the results, in Simalungun District, 69% of the participants had no idea, 13% slightly understood on the processes involved in EFP development, 9% moderately understood and only 9% understood well of EFP development processes. Reading Table 2 in the same manner would, on average, indicate the following nature of comprehension on EFP development prior to completing the dialogues:

i. In terms of comprehension on definition of EFP:
   - 70.9% had no idea on what EFP was
   - 15.8% slightly understood on EFP
   - 7.7% moderately understood on EFP
   - 5.6% well understood on EFP

ii. In terms of the process involved in EFP development:
   - 76.2% had no idea on the processes
   - 10.7% slightly understood on the processes
   - 7.4% moderately understood on the processes
   - 5.8% understood well on the processes

iii. When asked about preferred roles in EFP development:
   - 63.2% mentioned as labourers
   - 16.9% as supplier of planting materials
   - 36.8% as wood trader

iv. When asked about potential benefits:
   - 92.5% mentioned about fuel wood production
   - 70.1% mentioned about fodder supply
   - 40.0% mentioned about source of bee honey
   - 40.6% mentioned about environmental benefits

Dialog session at Kisaran (Photo by PMU)

Dialog session at Pakpak Bharat (Photo by PMU)

Table 2. Nature of participant's comprehension on EFP development prior to implementing the dialogues in 13 Districts (%)

No	Districts	1.Definition				2.Process				3. Roles			4.Benefits			
		a	b	c	d	A	b	c	d	e	f	g	h	i	j	k
1	Sim	69	13	9	9	70	15	9	6	57	26	50	89	67	41	17
2	Asa	60	14	13	13	60	14	13	13	63	19	57	91	71	58	33
3	Kar	55	30	10	5	75	15	5	5	90	9	79	95	75	45	45
4	Dai	82	11	5	2	82	9	5	4	67	15	60	93	69	42	38
5	PPB	69	16	9	6	75	13	6	6	59	12	42	94	69	41	44
6	Sam	78	15	5	2	83	7	5	5	59	15	39	93	71	27	29
7	Hum	74	14	7	5	79	7	7	7	67	15	34	91	65	33	35
8	Tob	60	19	11	10	75	11	8	6	65	25	24	92	81	48	54
9	TPU	56	24	11	9	72	13	9	6	81	18	22	93	76	48	50
10	TPT	77	13	8	2	79	8	8	5	54	17	18	92	69	36	67
11	PLU	81	11	5	3	86	5	6	3	61	16	18	94	64	33	39
12	TPS	81	11	4	4	77	9	8	6	60	18	22	92	71	38	40
13	MDN	80	14	3	3	77	13	7	3	60	15	13	93	63	30	37
	Average	70.9	15.8	7.7	5.6	76.2	10.7	7.4	5.8	63.2	16.9	36.8	92.5	70.1	40.0	40.6

Notes:

1. Definition of EFP development
2. EFP development process
3. Potential roles of farmers
4. Potential benefits of EFP

01

a. no idea
b. slightly understood
c. moderately understood
d. well understood
e. as laborers
f. as suppliers of planting materials
g. as traders of energy wood
h. fuel wood
i. fodder
j. bee honey source
k. environment

Dialog sessions at Tapanuli Selatan and Tapanuli Utara districts (Photos by PMU)

c. Participation in EFP development

After completion of each dialogue session the participants were asked about their potential involvement in EFP development program; response of the participants is summarized in Table 3.

Table 3. Potential participation of farmers in EFP development (%)

No	Districts	Interest to participate			
		Very strong	Moderate	Hesitant	Nil
1	Simalungun	22	37	28	13
2	Asahan	24	40	29	7
3	Karo	20	45	30	5
4	Dairi	18	42	36	4
5	Pakpak Bharat	28	38	28	6
6	Samosir	24	32	32	12
7	Humbang Has	30	35	30	5
8	Toba Samosir	25	35	38	2
9	Tapanuli Utara	24	33	39	4
10	Tapanuli Tengah	20	31	41	8
11	Padang Lawas Utara	19	31	39	11
12	Tapanuli Selatan	19	25	48	8
13	Mandailing Natal	20	33	40	7
Average		22.5	35.2	35.2	7.1

Table 3 clearly indicates that 35.2% of the participants were hesitant of or not interested in supporting EFP development. The reasons for this reluctance were unclear market for planted wood under EFP program and bad experience in planting trees on state forest lands which will be discussed in the next chapter.

Dialog sessions at Toba district (Photos by PMU)

3.2. Training of Local Communities on Skills for EFP Development

a. Implementations of the training modules
As mentioned in the preceding session, the training program was arranged under 5 modules; their implementation arrangements are summarized in Table 4.

Table 4. Arrangement for implementation of training modules

Modules	Dates	FMUs involved	No. of trainees	Executor
1,2&3	25-26 Sep 2019 12-13 Nov 2019 02-03 Oct 2019	Simalungun Hum-Has Tap-Sel	34 34 34	UD Tunas Rimba
4	26-27 Nov 2019 04-05 Dec 2019	Simalungun Tap-Sel	34 34	CV Bumi Hijau
5	07-09 Jul 2019	Simalungun	35	Mr. Aam Hasanudin professional practitioner
All modules			205	

The information presented in Table 4 deserves clarification as follows:

Practical training on nursery development (Photo by PMU)

- Modules 1,2 and 3 had been implemented simultaneously due to the strong connection between the modules, i.e. Module 1 on production of planting materials, Module 2 on land and soil preparation and planting, Module 3 on plants maintenance; the modules were implemented at 3 FMUs;
- Module 4 on harvesting of energy tree species was implemented only at 2 FMUs as no trees were harvestable at Humbang-Hasundutan FMU;
- Module 5 on bee honey production was conducted only at Simalungun FMU; the training was unplanned activity but was introduced to serve as an incentive for farmers to grow energy tree species that can also be used to produce bee honey.

Training on setting up temporary nursery at Simalungun FMU (Photo by PMU)

Training on planting of seedlings at Tapsel, (Photos by PMU)

b. Trainees

It should be noted that the trainees on Modules 1, 2 & 3 were the same trainees as on Module 4 while trainees on Module 5 were recruited independently of Modules 1, 2, 3 & 4. On this note, the farmers actually trained on skills for EFP development was 102 persons in total but number of participants was 205 persons including 35 on Module 5.

Practical training on harvesting of trees (Photos by PMU)

Training on harvesting techniques at Simalungun FMU (Photos by PMU)

3.3. Training on Village Cooperative Management

- The training was conducted on 09-10 August 2020 at the city of Pematangsiantar. The trainers were professionals having strong practical experience in cooperative management.

Classroom lecturing on cooperative management (Photos by PMU)

- The training was performed with strong emphasis to class discussion on planning, organizing, actuating and controlling aspects of village cooperative.

Working group on cooperative operational planning (Photos by PMU)

- The trainees, originated from ten different districts, were 35 persons in total, short of the planned target, i.e. 50 persons.

3.4. Conduct of Comparative Studies on Wood-based Energy Development

a. Vietnam comparative study
The study was conducted on 13-19 May 2019 with 17 participants in total comprising representatives of the Ministry of Environment and Forestry (3), District Government of Tapanuli Utara (2), ITTO Project PD 737/14 Rev.2 (I) (4), Association of Indonesia Forest Concession Holders (6), and Indonesian Furniture Association (2). Results of the study are highlighted below:
   - Since 2016, forest resource management in Vietnam has been focusing on forest plantation development involving forest

Welcoming meeting organized by Vinafor in Hanoi (Photo by PMU)

companies and local communities; to accelerate pace of development, the government granted incentives in different forms including no-charge licensing, free land tax, etc.

- A policy on banning of harvests on natural forest has been put in place for decades now.

Visiting Woodlands Company and one of wood pellet company by Indonesian delegation (Photos by PMU)

- The total export value of wood products in 2018 reached USD 9 B; the wood processing industries obtained nearly 80% of raw material from owned planted forests; the balance was imported.
- The spectacular export performance was attributable to at least 5 forces, namely:
  - ✓ Highly productive and inexpensive labour force
  - ✓ Availability of quality infrastructure
  - ✓ Efficient small and medium sized forest enterprises
  - ✓ Provision of incentives for foreign investment
  - ✓ Collaboration with world class wood industries

b. Ganzhou comparative study

The comparative study to Ganzhou in Jiangxi province of China was performed by Mr. Jimmy Chandra, the Project Coordinator, on 24-30 May 2019. The important lessons learned from the comparative study are summarized below:

- The basic strategy pursued by China for its forest industry development were:
  i. Clustered forest industries allowing efficient collection and use of wood wastes
  ii. Operation of grand kiln-drying facilities avoiding unnecessary capital investment by family and small-sized wood industries
  iii. Operation of wood terminals in buying and selling of wood raw materials of wide range of species at big volumes leading to low unit cost of raw material
  iv. Continued innovation in processing technologies leading to higher and higher efficiency of processing and better quality of processed woods

- China is more interested in the production of black pellet than wood pellet for different reasons including better price of black pellet, investment in wood pellet industry is only feasible using wood wastes as the raw material but with uncertain supply, planting of trees for wood pellet is not economical due to slow growth and strong competition by chip wood industries;

- China provided training facilities, free of charge, for countries that support GGSC (Global Green Supply Chains) Initiative on efficient wood processing technologies.

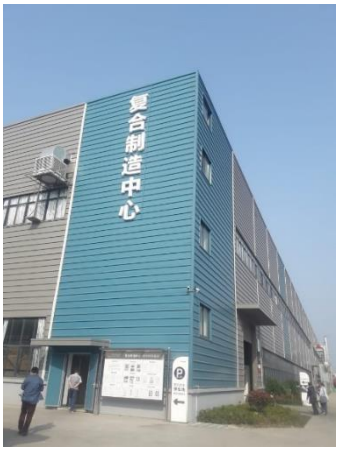
c. Shanghai comparative study

The study was performed by Mr. Istanto of the Executing Agency and Dr. Hiras Sidabutar of the PMU from 22 to 25 October 2019; it was a participation in the International Forum called "Together Towards Global green Supply Chains: A Forest Products Industry Initiative". The forum was jointly organized by the International Tropical Timber Organization (ITTO), China Timber and Wood Products Distribution Association (CTWPDA), Centre for International Forestry Products Trade (CIFPT) of the National Forestry and Grassland Administration of China (NFGA), Association Technique Internationale Des Bois Tropicaux (ATIBT) and other supporters and contributors.

Mr. Istanto of Executing Agency and Dr. Hiras Sidabutar attended the International Forum: "Together Towards Global green Supply Chains: A Forest Products Industry Initiative" (Photo by PMU)

Among the important conclusions and recommendations made by the forum were:

i. The role of production forests in climate change and sustainable development had been recognized by the IPPC and UNFCCC;
ii. To safeguard the functions of tropical production forests, a huge investment is needed for restoration, sustainable management and biodiversity conservation of the forests;
iii. LSSC is essential for the optimal utilization of tropical production forests, mitigation and adaptation of climate change and promotion of national as well as international developments;
iv. In-action cost of not practicing LSSC (Legal and Sustainable Supply Chain) is extremely high; without economic and other forms of incentive for SFM and LSSC, use of lands for forest products cannot compete with alternative uses;
v. International trade of forest products, wood and non-wood, would be more rewarding if global rules of trade could be harmonized;
vi. A huge amount of funds is required for enhancing capacity in building up "green supply chains" from the forest to market; and
vii. LSSC/GGSC is required for linking the producers, processors and consumers in view of exchanging information and promoting mutually benefitting forestry business.



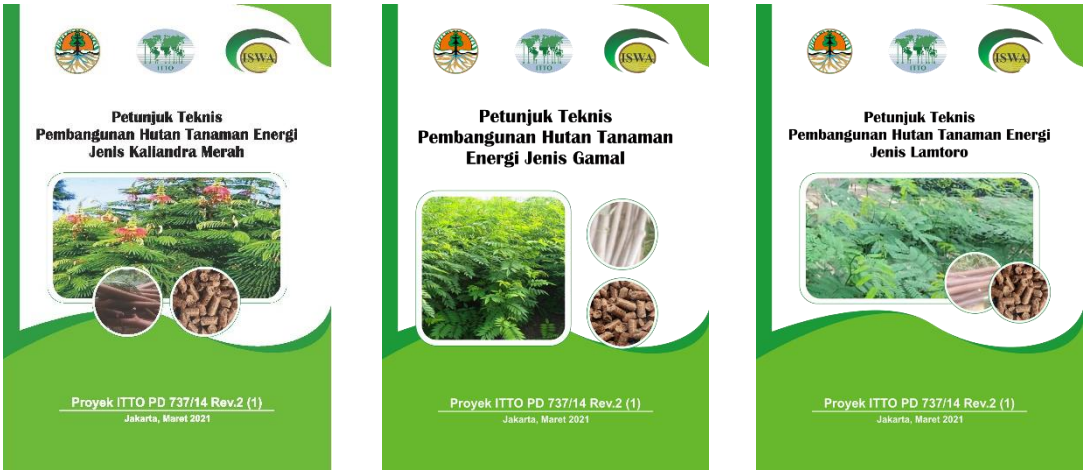
Visiting wood-flooring company in Shanghai (Photo by PMU)

3.5. Technical Manuals for Growing Energy Tree Species

- Technical manuals for growing gamal, kaliandra and lamtoro in North Sumatera have been developed, ready for distribution to potential users especially farmers and FMUs.
- The manuals were developed based mainly on documented experience in growing the species in different localities including the demonstration plots of the ITTO project in North Sumatera.
- Admittedly, the manuals are not free of weakness but they must be useful for guiding the operation of forest plantation establishment using gamal, kaliandra and lamtoro species.

The manuals shall be continuously improved using the experience in their field application.

- It should be noted that an EFP developed using the manuals is for sourcing wood as raw material for producing chip wood, wood pellet or electricity through direct or indirect conversion.



Technical manuasl for kaliandra, gamal and lamtoro (Photos by PMU)

4. Discussions

4.1. Delivery of Output 2

Proponents of the project hypothesized that Output 2, “Skilful manpower for development of wood-based biomass energy available”, will be delivered if all planned activities have been fully implemented. Prerequisite to accepting or refusing the hypothesis is to assess “fullness” execution of all 5 activities under the output.

Activity 2.1: To conduct dialogue with local communities on benefits of energy forest development

- The activity had been executed with the assistance of University of Simalungun, executed involving 49 villages and participated by 527 villagers in total. The planned number of participants was 50 villages, meaning a 98% level of achievement. No indicator was specified by the logical framework with respect to number of participating villagers.
- The methodologies applied in implementing the activity, the materials presented, and selected executor were appropriate and in accordance with the terms of reference of the activity as well as applicable ITTO rules and procedures.
- It is reasonable to conclude that the activity had been fully implemented despite the fact that the level of achievement was only 98%.

Dialog session at Simalungun district (Photo by PMU)

Dialog session at Humbang Hasundutan (Photo by PMU)

- The original logical framework specified that the dialogue with local communities should be conducted at 50 villages in 25 Districts of North Sumatera province. The PMU decided to confine location of the dialogue to only 13 Districts because, based on available information, degraded lands in the other 12 Districts were very limited in size as most lands had been occupied by oil palm plantations, the commodity adored most by local communities. The notion then adopted by the PMU was "conducting dialogues on EFP at 12 Districts would be less fruitful" as local communities were very fond of growing palm oil for technical and economic reasons which resulted in very limited size of degraded lands available for EFP development.
- At commencement of the dialogues, most participants had no idea on EFP (70%) and did not understand on what process would involve in EFP development (76.2%); consequently, most participants perceived that their role in EFP development would be at best as labourers (63.2%) and potential benefits of EFP are for fuelwood.
- At the commencement of dialogues, only 57.7% of participants were interested in joining proposed EFP program while the rest (42.3%) were either hesitant or "no interest" due mainly for uncertain market for energy wood produced under the EFP program and bad experience in planting trees on state forest lands.
- The investment plan for energy wood utilization in the making of wood pellet and that energy wood species planted by communities on production FMUs are certainly harvestable were then announced by the consultant. The effect was amazing; nearly all participants have now become interested in joining proposed EFP program at the end of individual dialogue sessions.

Activity 2.2: To train local communities on technical skills for energy forest development

- The training program was divided into 5 modules: 4 required modules and one module as an incentive for participation in EFP development;
- The executors were competent small local firms; the methodologies employed were reasonable and 205 farmers were trained: 170 farmers on the 4 required modules and 35 farmers on the incentive module (bee honey production);
- The activity had indeed been fully implemented;
- The training program was divided into 4 Modules with a total number of community leaders trained only 102 persons but the number of people participated in the 4 Modules was 170 people. This must be so because the 102 people trained on Modules 1, 2 and 3 at 3 sites, 68 of them were also participants in Module 4 training at 2 sites. Note that the logical framework defined indicator of training achievement as "100 community leaders trained on EFP development techniques"; the indicator was surely satisfied by the training program;

- It should also be noted that Module 5, training on bee honey production, was an unplanned activity; it was introduced by the project as an incentive for farmers to take part in EFP program as bee cultivation on kaliandra species planted could produce honey that has a strong local market thus would provide additional income.


Training on planting and harvesting at Simalungun FMU (Photos by PMU)

Activity 2.3: To train local communities on village cooperative management

- Proponents of the projects argued that EFP development, if realized, will involve large number of villagers, huge amount of material inputs to procure and big volume of wood products to market. To be efficient, villagers involved are best organized their works through village cooperative;
- Therefore, village leaders need to be equipped with managerial and technical skills for running village cooperative; it had been planned to train 50 village leaders on the subject;
- The trainers involved, material presented and trainees recruited all indicated that the activity had been fully executed in Pematangsiantar City with 35 participants;
- The logical framework specified that “50 farmer leaders trained on community cooperative management”. Indeed this training had nothing to do with skills for EFP development techniques; it was a training designed to efficiently organize the farmers involved in EFP program that benefits of the program accruable to farmers would be optimized;
- The realized number of farmer leaders trained on community cooperative management was only 35 persons or 70% of the planned number. The mitigating policy on covid-19 pandemic put in place was strictly enforced by the local governments which limited number of people to assemble in one hall or classroom. It was very difficult then to find a room that could accommodate nearly 60 people, comprising trainees, trainers and project staff, while conducting two training sessions was not feasible on ground of training cost. Consequently, the largest room found by the project could accommodate only 40 people, 35 participants plus 2 trainers and 3 organizers.

Training on village cooperative management at Simalungun FMU (Photos by PMU)

Activity 2.4: To conduct comparative studies on wood-based energy development

- This activity did not directly affect skilfulness of local people; indirectly, however, it could affect skills of manpower through improved training strategy and program as recommended by the studies conducted or open opportunities for technological training offered by GGSC sponsoring countries;
- Three studies on wood-based energy development had been performed by representatives of both the executing and collaborating agencies with twenty participants in total;
- The studies did not directly contribute to improving skills of farmers on EFP but surely can enhance policy making if results of the studies are used by policy makers;
- The logical framework defined “2 comparative studies on wood-based energy development conducted in years 2-3”. In fact, 3 studies had been realized involving 3 officers of the executing agency and 3 members of the PMU. Therefore, indicator of achievement had been fully satisfied.

Activity 2.5: To develop technical manuals for growing gamal, kaliandra and lamtoro for energy wood production

- Under Activity 2.1, villagers had been informed of the EFP as regards its definition, potential benefits, processes and requirements; under Activity 2.2, villagers had been taught on how to grow gamal, kaliandra and lamtoro; under Activity 2.3, villagers had been trained on skills for establishing and managing village cooperatives as the vehicle for villagers to efficiently perform EFP related activities; while under Activity 2.4 opportunities for enhancing capacity of manpower had been explored;
- To ensure proper conduct of growing gamal, kaliandra and lamtoro, villagers also have been equipped with technical manuals for each species. The manuals should guide tree growing operations, avoid mistakes due to lost of memory in part of trained farmers;
- 3 manuals had been developed by a competent, experienced expert and reviewed by professionals; the manuals had been printed out and are ready for distribution to users, especially villagers;
- Indeed, it is reasonable to conclude that the activity had been fully implemented;
- The logical framework of the project specified “3 technical manuals on energy forest development using gamal, kaliandra and lamtoro species formulated” as one of the indicators of achieving Output 2. Indeed, as highlighted in the previous section, this indicator had been fully fulfilled;

- The technical manuals developed are complimentary to the training on technical skills conducted under Activity 2.2. In case there is a prolonged time lapse between the training and actual EFP operations, the manuals will be guiding farmers and field supervisors in performing their jobs.

As all pertaining activities to Output 2 had been fully implemented, the output must have been delivered, thus the hypothesis made by the proponents is accepted. Achievement indicators of Output 2 defined by the logical framework were:

i. Dialogues with local communities of 50 villages in 25 districts conducted
   - Under Activity 2.1, dialogue on benefits of EFP developed with local communities of 49 villages in 13 Districts had been realized with 527 participants in total
   - Hence, the indicator was 98% satisfied.
ii. 100 farmer leaders trained on EFP development techniques
   - In total, 205 farmer leaders were trained under Activity 2.2 on techniques for production of planting materials and nursery, land and soil preparation as well as planting, maintenance of plants and harvesting;
   - Therefore, realized number of trained farmers had far exceeded the planned indicator.
iii. 50 farmer leaders trained on community cooperative management.
   - Realized number of trainees on the training on cooperative management was 35 community leaders, much lower than the plan, due mainly to the strict enforcement of health protocol on covid-19 pandemic control by the local government;
   - The indicator was only partly met.
iv. 2 comparative studies on wood-based energy development conducted
   - 3 studies on wood-based energy development had been conducted to Vietnam and China involving 6 officers and staff of the executing and collaborating agencies;
   - The indicator had been fully satisfied
v. 3 technical manuals on energy forest development using appropriate species formulated
   - Technical manuals on growing gamal, kaliandra had been developed and ready for distribution.
   - The indicator was fully met.

Above discussions indicated that four defined indicators of achievement of Output 2 had been fully met while one indicator was only 70% met. Overall, it is reasonable to conclude that all indicators had been met thus Output 2 had been delivered as all pertinent activities on the output were fully implemented as previously discussed.

4.2. Quality of the Output Delivered

Output 2 was defined as “skilful manpower for development of wood-based biomass energy available”. The analysis on implementation of the activities pertaining to Output 2 presented in the previous section concluded that Output 2 has been delivered as all its pertinent activities had been fully executed and all defined indicators of the output satisfied.
The remaining aspect of delivered output that deserves elucidation in order to avoid misleading on follow up actions is on the quality of delivered output in terms of trained skills and sufficiency of trained manpower.

a. The skills trained
   - Output 2 was defined as “skilful manpower for development of wood-based biomass energy available”. This definition clearly indicates that skilful manpower is needed for development of wood-based biomass energy which encompasses the activities relating to energy wood supply, i.e. energy forest development, conversion of the energy wood into desired energy, i.e. wood processing and utilization of produced energy, i.e. energy marketing.
   - Careful examination of the skills trained revealed the following facts:

- ✓ Activity 2.1: focussed on delivering information on potential benefits of EFP accruable to local communities for purpose of raising interest in EFP development; knowledge of participants on EFP benefits was improved and interest in EFP development program raised. In fact, the activity did not provide technical training on skills relating to energy wood supply, processing and energy marketing;
- ✓ Activity 2.2: covered only training skills for EFP plantation development; training on skills for energy wood conversion and marketing of its products was not included;
- ✓ Activity 2.3: confined only to training on skills for community cooperative management; it did not deal with skills for energy wood supply nor energy wood conversion and utilization;
- ✓ Activity 2.4: focussed on learning on wood processing technologies and marketing of wood products in general; it did not directly concern with skills for wood-based energy development;
- ✓ Activity 2.5: dealt with development of technical manuals to guide use of the skills taught under Activity 2.2 for EFP development.

- Above discussions indicate that trained or available manpower were equipped only with skills for EFP development or energy wood supply which is only part of the processes involved in wood-based energy development. In other words, the skills trained under individual activities on Output 2 were insufficient as they were confined only to skills for EFP development, i.e. wood energy supply, not for wood-based energy development. While defined indicators of Output 2 had been fully satisfied through the full execution of pertaining activities, the indicators were inappropriately defined as the indicators were confined only to EFP development.
- In conclusion, the skills acquired by the trainees through the training program under the project were insufficient for developing wood-based biomass energy but only sufficient for EFP development. The training program under Output 2 could have been defined to include skills needed for wood-based biomass energy, not only skills for EFP development; concomitantly, indicators of the output were defined accordingly. Obviously, this sub-optimal quality of the output delivered was originating from the project design thus it was a blunder of the project planner, not of the project executor.

b. Availability of skilful manpower

- Output 2 was defined as “skilful manpower for development of wood-based biomass energy available“. The definition implies that, at completion of the project, manpower needed by an investor to develop a wood-based biomass energy is available in terms of skills and number. As discussed in the previous section, the farmers were trained only on skills for developing source of raw materials, i.e. energy forest plantation, covering the skills for preparation of soil and land for planting, production of planting materials, planting, maintenance of plants and harvesting. Skills for the processing of wood energy produced and utilization of yielded energy were not the subject of the training program. In other words, skilful manpower is only partially available on ground of the skills acquired.
- As the energy development value chains were not fully covered in the training program, skilful manpower is available only for energy wood supply chains. If skilful manpower is to be fully available, training on the processing of energy wood and marketing of the energy produced also needs to be performed.
- Previous discussions clearly indicated that indicators of achievement of Output 2 were inadequately defined by the project proponent by reducing the indicators only to wood-energy supply chains.

5. Conclusions and Recommendations

5.1. Conclusions

i. All defined activities on Output 2, five of them, had been fully implemented; hypothetically, the output must have been delivered, i.e. skilful manpower for development of wood-based biomass energy available;

ii. Examination of defined indicators of Output 2 indicated that all indicators had been satisfied; conceptually therefore, Output 2 had been delivered;

iii. Close examination of defined Output 2 revealed that:
   - Skilful manpower for wood-based energy development was intended available at completion of the project but defined indicators pertained only to energy-wood supply chains.
   - In effect, the manpower made available by the project had acquired only skills for energy wood supply value chains not for the entire wood-based biomass energy development or only partially available in terms of skills.

iv. Defined indicators of achievement of Output 2 were inconsistent with defined scope of Output 2; the indicators concerned only with energy wood supply chains while defined output dealt with the entire value chains of wood-based energy development;

v. Conceptually, Output 2 had been fully achieved but practically, it had been achieved only partially, i.e. skilful manpower was available only for energy wood supply chains, not for wood-based biomass energy development;

vi. The project proponent had inappropriately defined the indicators of achievement of Output 2 and the output was incorrectly specified.

5.2. Recommendations

i. Results of the dialogues at 49 villages clearly indicated that local communities were enthusiastic to join the EFP development program under the conditions that market for wood energy produced is readily available and that the trees grown are legally harvestable. With these conditions, it is strongly recommended for the executing and collaborating agencies to realize investment in the construction of a wood-pellet factory and for the government to warrant right of local communities to harvest the energy forests they had developed;

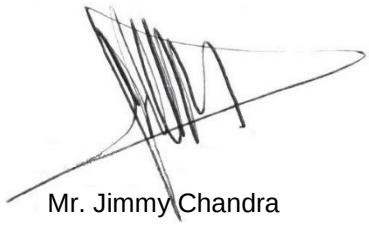
ii. As EFP will be established on unproductive state forest lands, potential values of EFPs are not confined to only economic but also social and environmental benefits. In this light, it is strongly recommended for the MoEF to assign one of the state-owned forest companies to invest in wood pellet industry development in North Sumatera should none of the ISWA member or other private companies is interested in the business line.
iii. In defining indicators of achievement of any planned deliverables it is strongly recommended for project proponents to carefully identify and specify every single deliverable before defining SMART indicators of the deliverable in question. Such procedures will insure consistency between a deliverable and its indicators of delivery or achievement.

6. Implication for Practice

- The feasibility study on investment in wood-pellet industry in North Sumatera conducted in 2019 by a team of professionals concluded that the investment is financially feasible yet no investor is interested in the business as to date. Suspectedly, the assumption on selling price was too high compared to current price following the study. If so, the MoEF should consider to invest through a state-owned forest company, Perhutani or Inhutani, in the name of social and environmental benefits despite the need to provide subsidy temporarily due to recent market slump.

- The training on skills for EFP development was conducted three years ago; no planting program is going on as to date or, perhaps, in the short run. There is a fear for the trained farmers of forgetting the skills they had once acquired while re-doing similar training might not be feasible due to the bad experience of farmers in utilizing the skills learned and issue on financing. Realizing investment in wood pellet business appears to be the most feasible direction to follow in order to convince local communities on the need to establish EFP using the skills they had learned and re-gain their support on EFP development program.

Responsible for the report

Project Coordinator	Management Advisor
	
Mr. Jimmy Chandra	Dr. Hiras Sidabutar

Date: November 2021

Selected References

DG PHPL & ISWA, 2014. “Developing Supply Capacity of Wood-Based Biomass Energy through Improved Enabling Conditions and Efficient Utilization of Degraded Forest Lands involving Local Communities in North Sumatra Province of Indonesia. A project proposal submitted to ITTO by DG PHPL and ISWA for financial assistance.

Effendi, Riskan. 2021. Petunjuk Teknis Pembangunan Hutan Tanaman Gamal/Kaliandra/Lamtoro untuk Bahanbaku Energi Berbasis Biomassa Kayu. Technical Report on Activity 2.5. ITTO Project PD 737/14 Rev.2 (I).

ITTO Project PD 737/14 Rev.2 (I), 2019. To conduct comparative studies on wood-based biomass energy industry development for selected executives and managers. Technical Report on Activity 2.4. Prepared by the Project Management Advisor, Dr. Hiras Sidabutar.

ITTO Project PD 737/14 Rev.2 (I), 2020. To train local communities on technical skills for energy forest development using gamal, kaliandra and lamtoro. Technical Report on Activity 2.2. Prepared in collaboration with CV. Bumi Hijau and CV> Tunas Rimba

ITTO Project PD 737/14 Rev.2 (I), 2020. To train local people on village cooperative management. Technical Report on Activity 2.3. Prepared in collaboration with Koperasi Makmur Mandiri.

Universitas Simalungun PematangSiantar, 2019. Dialog pengembangan hutan tanaman energi di Sumatera Utara. Technical Report #4, ITTO Project PD 737/14 Rev.2 (I)