COMPLETION REPORT

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

Prepared for the project by:

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

Jakarta, December 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)

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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, December 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)
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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

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List of Abbreviation and Acronyms

DG PHPL	Directorate General Of Sustainable Production Forest Management (Ditjen. Pengelolaan Hutan Produksi Lestari)
EFD	Energy Forest Development
EFP	Energy Forest Plantation
FGD	Focussed Group Discussions
FMU	Forest Management Unit
FRI	Forest Research and Innovation
FTR	Final Technical Report
GoI	Government of Indonesia
ISWA	Indonesian Sawmill and Woodworking Association
ITTO	International Tropical Timber Organization
KTH	Forest Farmers Group (Kelompok Tani Hutan)
LFM	Logical Framework Matrix
MoEF	Ministry of Environment and Forestry
MoEMR	Ministry of Energy Mineral Resources
NGO	Non-Government Organization
NSPFA	North Sumatera Provincial Forestry Agency
PMU	Project Management Unit
PSC	Project Steering Committee
R & D	Research and Development
SCF	Stakeholder Consultation Forum
UHP	Production Forest Development (Usaha Hutan Produksi)
YPO	Yearly Plan of Operation

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Executive Summary

Project identification

1. The information on national energy market released by the Government back in 2014 clearly indicated the problems facing the market. Most important ones were the sluggish development of supply capacity, high dependence on fossil energy and sub-optimal utilization of renewable energy.
2. In its efforts to overcome the problems, the Government decided to implement policies on both the supply and demand sides of the market. On the supply side, the policy focussed on increasing new renewable energy share in the national energy mix from the current 7 percent to 23 percent by year 2025.
3. ITTO Project PD 737/14 Rev. 2 (I) was formulated by MoEF and ISWA in response to the problematic energy market situation and as a follow-up to the recommendation of the ITTO-sponsored "Asia-Pacific Regional Forum on promoting wood-based bio-energy using wood residues and wastes in tropical countries" held in Jakarta in October 2008.
4. The proponents observed then that supply capacity of renewable energy by the forest sector in North Sumatera was definitely small due mainly to the weak enabling conditions for building up supply capacity of wood-based biomass energy which included: sustainable supply of energy wood was not developed, skilful manpower for wood-based energy development was not available and investment in wood-based energy development lacking.

Project objectives and implementation strategy

5. The specific objective of the Project PD 737/14 Rev. 2 (I) was defined as "To improve enabling conditions for building up capacity to supply wood-based biomass energy in North Sumatera region" 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, and iii) investment in wood-based energy development promoted.
6. Development objective of the project was "to increase contribution of the forest sector to renewable energy supply and regional economic development through increased supply of wood-based biomass energy.
7. The implementation strategy pursued was built on the results of the stakeholder consultation meetings and on the lessons learned from the implementation of completed ITTO projects. The elements of the strategy were: securing long-term supply of energy wood, selecting high-calorific wood species to develop, training of manpower, promoting investment, functioning stakeholder consultation forum, internal monitoring and collaborating with the relevant partners.
8. The project was implemented in full observance of the project agreement, existing ITTO rules and procedures as well as GOI's regulations governing international cooperation.
9. The potential risks identified during the project formulation stage had been successfully kept from occurring through execution of planned mitigating measures in a consistent manner.

Project performance

10. All planned activities had been fully executed, with minor adjustments to scope of three activities and to timing of execution of one activity, with the prior expressed approval of the ITTO or PSC.

11. As all planned activities had been fully implemented, three planned outputs should have been delivered noting that the second output on skilful manpower was only partially delivered due to inappropriate defining of output indicators.

12. While all planned activities had been fully executed, planned outputs were only partially delivered, the specific objective must have been achieved only partially due to partial delivery of Output 2.

13. All planned project activities were completed within the sanctioned time and budget, i.e. from October 2017 to September 2021; a completion report and relevant technical report(s) should be submitted to the ITTO by end of December 2021 while a final financial audit report by end of January 2022.

Project outcomes and involvement of target beneficiaries

14. The matching of defined indicators of the specific objective with the outcomes of the interventions clearly indicated that the specific objective was only partially achieved due mainly to the forces beyond control of the PMU i.e. pandemic covid-19 and plummeting price of wood pellet.

15. Among the tangible results of individual project activities that did not exist prior to implementing the project include: information on suitable lands for EFP, demonstration plantation of gamal, kaliandra and lamtoro, estimates of potential energy wood production from forest and non-forest sources, trained community leaders on skills for EFP development and for village cooperative management, technical manuals for growing gamal, kalindra and lamtoro, project website, calorific properties of planted wood and report on feasibility of investment in wood pellet industry.

16. The target beneficiaries had been involved in the project implementation operations: the NSPFA and FMUs were involved in national workshop, in the establishment of demo plantations; the local governments were involved in the arrangement of the dialogues between the project and local communities and in the formation of stakeholder forum; local communities were involved in the establishment of forest models, in the dialogues and trainings; the private sector was involved in the FGD on investment, on the training of local communities on skills for EFP development and village cooperative management.

Project sustainability

17. The prospect for sustainability of the project is excellent under one condition: that investment in energy wood processing is realized. If this condition is met, market for energy wood would be secured which is a strong incentive for the local communities and FMUs to get involved in and support wood-based biomass energy development.

18. If market of energy wood were secured, local economies would be growing, small local firms and village cooperatives would be carrying out different productive, economic activities relating to supply of energy wood; private firms and cooperatives would be gaining economic incomes from energy wood processing activities. Security of market for energy wood and wood-based energy is the key to sustainability of the project and market would be secured only by investment in wood-based energy development.

Lessons learned

19. Among the important lessons learned from the project formulation phase were:

- The key problem addressed by the project had a strong rationale as it was based on observed, real problems surrounding the national energy market of Indonesia which was closely linked with the too low share of renewable energy in the national energy mix; the key problem identified was affirmed by the primary stakeholders;
- The key problem identified was thoroughly analysed involving representatives of the stakeholders to fully understand its cause-effect relationship by identifying the consequences as well as the direct and indirect causes of the key problem;

- The clear cause-effect relationship had facilitated construction of a sound project design with a strong vertical logic, relevant elements and well defined interventions;
- The sound project design had eased the operational planning and facilitated the smooth implementation with only minor adjustments to planned activities;
- Project planners should attempt to distinguish between conceptual or normative achievement with factual or real achievement when defining SMART indicators of outputs and objectives in order to minimize time lapse between the two forms of achievement.

20. Among the important lessons learned from the project implementation phase were:

- The small PMU under ISWA, comprised only four key personal, was proved able to properly manage project operations and could easily adapt to changing project environments;
- The key success factors of the project were primarily the strong leadership of the Project Coordinator, his good working relation with internal as well as external partners, with the executing agency and FMUs in particular;
- Continued communication and coordination between the PMU and the ITTO Secretariat had significantly contributed to overcoming different operational issues and speeding up the pace of operation;
- The high compliance of the PMU to rules and procedures applying to ITTO projects as well as to the project agreement had facilitated completion of the project within the sanctioned time and funds;
- The supportive government authorities and cooperative local communities had simplified and eased the full execution of planned project activities.

Conclusions

21. The conclusions drawn from the project development and implementation phases are:

- The key problem addressed was in conformity to the actual problems surrounding the national market of energy in Indonesia which was defined as “weak enabling conditions for building up supply capacity of wood-based biomass energy in North Sumatera region”.
- The key problem addressed was adequately analysed, its main causes and sub-causes as well as consequences were clearly specified. The project design was developed based on a clear and logical cause-effect relationship that its vertical logic was strong and its elements were consistent with the problems to be resolved;
- The roles and responsibility of the Executing Agency, Directorate of Production Forest Development (UHP of DG PHPL) and ISWA as the collaborating agency and implementing unit of the Project were clearly defined in the MOU duly signed by both parties which had avoided any confusion during the course of project implementation;
- The project had been smoothly implemented and successfully completed, which were made possible by, among others: the sound project design, the effective and appropriate implementation strategy pursued, the adequate resources in terms of time, funds and manpower, the strong support of the primary beneficiaries, the able PMU and the continued support accorded by the ITTO Secretariat;
- The project operations were managed by a small PMU comprising the project coordinator, a secretary, a technician, a field supervisor and a management advisor that proved able to complete the project within the sanctioned financial and time budget;

- The specific objective defined was nearly achieved through the full execution of sixteen planned activities pertaining to three outputs, noting that no investment was realized in wood pellet industry during the project duration;
- The assumption made were valid throughout the project duration and the risk mitigating measures employed were effective in preventing risks from occurring; and
- The indicators of achievement originally defined had been revisited at the beginnings of the current years of operations, and necessary adjustment made based on progress in implementation to ensure applicability of the indicators as the tool for measuring project achievements.

Recommendations

22. The recommendations made consistent with the lessons learned and the conclusions are:

- It is strongly recommended for any proponent of ITTO project to always perform an adequate analysis of the key problem addressed, in accordance with existing ITTO manual for project formulation, to ensure a deep comprehension of the cause-effect relationship of the key problem;
- To be sound, a project design must be built on a clear cause-effect relationship to ensure relevance and effectiveness of planned interventions to resolve the problems at hand and achieve the planned specific objective effectively;
- To ensure a smooth and successful completion of a project, the enabling conditions that must be prevailing include: an adaptive project implementation strategy, an able PMU, sufficient financial resource, healthy communication and strong coordination between the PMU with internal as well as external partners;
- It is best to employ a small but able PMU in order to minimize overhead costs, ensure effective coordination with partners and maximize adaptability to changing environment;
- To ensure quality of project outcomes and deliverables, selection of consultants, experts, contractors and professionals to employ must be strictly based on experience, expertise and competence;
- The executing and collaborating agencies are strongly advisable to follow up the outputs and findings of the project in order to sustain the project; the agencies are also urged to find ways through their network and influence to realize the investment in energy wood production and utilization in order to secure market for energy wood and promote local economies;
- The potential risks associated with the project implementation should be defined correspond to the key assumptions made; relevant risk mitigating measures identified during the project formulation stage must be exercised and modified as necessary during the course of project implementation.

1. Project Identification

1.1. Context

The information on national energy market situation officially released by the Ministry of Energy and Mineral Resources (MoEMR) back in 2014 clearly indicated the problems facing the national energy market which included: i) the ever-growing consumption of energy but sluggish development of supply capacity, ii) high dependence of supply on fossil energy despite its limited reserve, iii) growing government subsidy on energy overtime, iv) sub-optimal utilization of renewable energies, v) weak energy conservation program, and vi) weak mitigation of climate change relating to production and consumption processes.

In its efforts to overcome the problems, the MoEMR had decided to implement policies on both the supply and demand sides of the energy market. On the demand side, the policy centered on improving efficiency in energy utilization from up-stream to down-stream, i.e. industrial, transportation, household and commercial sectors. On the supply side, the policy focussed on increasing new renewable energy share in the national energy mix from the current 7 percent to 23 percent by year 2025.

The forest sector of Indonesia has a great potential to contribute to achieving the mentioned national energy supply target through generation of wood-based biomass energy using available forest resources by growing energy trees on degraded, unproductive lands both within and outside the permanent forest estates. In addition, wood-based energy development was consistent with the national economic development principles currently adopted by the government, i.e. pro-growth, pro-jobs and pro-environment.

The ITTO Project PD 737/14 Rev. 2 (I) was built on above mentioned problems facing the national energy market, consistent with the policy adopted to increasing supply capacity of new renewable

energy, i.e. development of wood-based biomass energy using the huge size of degraded, unproductive forest lands.

1.2. Origin of the Project and the Problem Addressed

ITTO Project PD 737/14 Rev.2 (I) was formulated by MoEF and ISWA in response to the prevailing problems on national energy market reported by the MoEMR; it was also a direct follow-up action to the recommendation of the ITTO-sponsored “Asia-Pacific Regional Forum on promoting wood-based bio-energy using wood residues and wastes in tropical countries” held in Jakarta, Indonesia, in October 2008. North Sumatera province was selected as the project site considering the supply shortage of electricity power that persisted and the absence of commercial wood-based energy industry then in the region.

It was observed by the project proponents then that supply capacity of renewable energy in the forest sector of North Sumatera was unquestionably small; the proponents believed that the extremely small supply capacity was due to the weak enabling conditions for building up supply capacity of wood-based biomass energy. The weak enabling conditions, therefore, had to be removed if supply capacity of wood-based biomass energy could ever be increased. Consequently, the key problem addressed by the project was “weak enabling conditions for building up supply capacity of wood-based biomass energy in North Sumatera”.

The project proponents also strongly argued that the main and direct causes of the key problem were: i) sustainable supply of energy wood was not secured to support a sustainable wood-based biomass industry, ii) skilful manpower for wood-based industry development was not available or scarce, and iii) lack of investment in wood-based energy development. A Closer look onto the enabling conditions, they were in fact factors of production of wood-based energy, commonly identified as land (raw material), labour (manpower) and capital (investment) in the classical micro-economic texts.

2. Project Objectives and Implementation Strategy

2.1. Project Objectives

Consistent with the key problem addressed, objectives of the project were defined as:

- Specific objective:
  To improve enabling conditions for building up capacity to supply wood-based biomass energy in North Sumatera region
- Development objective:
  To increase contribution of the forest sector to renewable energy supply and regional economic development through increased supply of wood-based biomass energy.

2.2. Implementation Strategy

The strategy pursued was built on the results of the stakeholder consultation meetings held during the development stage and on the lessons learned from the implementation of other ITTO projects by ISWA and MoEF. Major elements of the strategy are highlighted below:

i. Securing long-term supply of energy wood raw material
   To secure sustainable supply of energy wood raw material, it was thought indispensable to establish energy forest plantations on available, suitable lands throughout the region. To augment supply potential of planted energy wood, other non-forest sources would also have to be utilized in close collaboration with rubber and palm-oil growers.

ii. Selecting most promising energy tree species for development
   The species promoted were gamal (*Gliricidia sepium*), kaliandra (*Calliandra callothyrsus*) and lamtoro (*Leucanea leucocephala*). The criteria employed in selecting the species were: calorific content, site requirements and silviculture techniques. Available information indicated that calorific contents of the species were 4,900; 4,720; and 4,464 c cal/kg, respectively; the species

do not require specific site conditions in terms of soil and climate; and silviculture techniques for growing the species are available and easy to apply.

iii. Training of manpower
Currently, competent manpower in wood-based energy development was hardly available. Therefore, manpower training was an essential program of the project. Such training would cover EFP and energy wood processing as well. The main participants of the training were local farmers. In addition, selected executives and managers of the executing and collaborating agencies were also trained on managerial aspect of wood-based energy development through organized study tours.

iv. Promoting investment
Wood-based energy supply can only be realized if private sector is interested in the business. Therefore, promotion of investment was an essential task of the project to accomplish. To this end, appropriate and sufficient activities had been carried out which included dissemination of information on feasibility of investment, incentive schemes to introduce, product market and technology, availability of wood raw material and trained manpower.

v. Establishing a Stakeholder Consultation Forum (SCF)
A SHF had been established to facilitate continuous exchange of information and experience amongst stakeholders notably concerned government authorities, private executives, forest managers and local communities.

vi. Internal monitoring
To effectively implement the project activities, it was necessary to exercise monitoring of progress in implementation. Inputs to individual activities had to be made timely available in terms of quantity and quality. To ensure an effective conduct of monitoring, a field supervisor was appointed whom was responsible for supervising the day-to-day project operations, coordinating with executors of activities and local authorities and reporting to the Project Coordinator on any operational issues that occurred.

vii. Collaborating
The project was implemented in a collaborative manner. As appropriate, particular activities were implemented involving local communities, small local firms, NGOs, Universities, R & D institutions and other professionals, selected based on competence and nature of works.

2.3. Assumptions and Risks

The major assumptions made to ensure a successful achievement of the project's objectives were:

- Cooperative local communities, to be built during the project development stage through an adequate dialogue process;
- Supportive local governments to be built through an adequate consultation process; and
- Interested private sector in making investment in wood-based energy development to be realized through wide dissemination of information especially as regards availability and sufficiency of wood raw material, market potential, processing technology and availability of trained manpower.

A risk arises when the assumption made as regards an action or event does not hold true. To avoid risks associated with each of the assumptions made, applied mitigating measures were as presented in Table 1.

Table 1. Assumptions, potential risks and applied mitigating measures

Assumptions	Potential risks	Mitigating measures
Cooperative local communities	Local communities did not cooperate	To hold dialogues on potential benefits of wood-based energy development accruable to local communities in the long-run
Supportive local governments	Local governments did not support planned project objectives	• To provide reliable information through consultation on potential benefits of wood-based energy development to regional economic and environmental development • To organize a regional workshop on wood-based energy development
Private sector interested in making investment in wood-based energy development	Private sector not interested in making investment	• To disseminate reliable information on potential market, processing technology, wood raw material and trained manpower • To hold a regional workshop on wood-based energy development

3. Project Performance

3.1. Planned vs Realized Performance

a. Specific objective

Planned

Planned specific objective of the project was: to improve enabling conditions for building up capacity to supply wood-based biomass energy in North Sumatera region

Realized

No change had been made to the planned specific objective as defined above; the specific objective had been realized as planned.

b. Outputs and activities

Table 2. Planned vs realized outputs and activities

Output/activity	Realized
Output 1: Development of sustainable supply of energy wood initiated	No change had been made to the originally defined Output 1; it had been fully realized as planned.
Activity 1.1: To identify suitable lands for development of energy forests in North Sumatera province	No change was made to the original Act. 1.1; it was 100% executed as planned.
Activity 1.2: To formally allocate lands for energy forest development on existing land use plan	At the approval of PSC, the activity was changed to become: To identify suitable lands for forest plantations in 3 FMUs; newly defined activity had been fully realized.
Activity 1.3: To establish energy forest models for purpose of demonstration and training (3 sites, 3 species, 36 Ha in total)	Only 33 Ha of planned energy forest model was realized due to scarce suitable accessible lands.
Activity 1.4: To provide estimates of sustainable supply potential of wood from energy forests.	No change was made to the originally defined activity; it had been fully realized.
Activity 1.5: To assess long-term supply potential of energy wood from non-forest sources	No change was made to the originally defined activity; it had been fully executed.
Output 2: Skilful manpower for development of wood-based biomass energy available	No change had been made to the original Output 2; it had been partially realized.
Activity 2.1: To conduct dialogues with local communities on benefits of EFD (50 villages in 25 districts)	The activity had been implemented only at 49 villages in 13 districts as 12 other districts had no sizeable lands for energy forest development; the change was made at the approval of the PSC.
Activity 2.2: To train local communities on technical skills for EFD covering nursery, planting and harvesting techniques (100 farmer leaders of 50 villages)	The training realized covered also skills for forest honey production at the approval of the PSC to serve as an incentive for farmers to take part in EFD.
Activity 2.3: To train local communities on cooperative management to support energy wood business (50 farmers leaders of 50 villages)	No change was made to the planned activity but realized only 35 leaders of 35 villages due mainly to the strict enforcement of protocols on covid-19 pandemic control.
Activity 2.4: To conduct comparative studies on wood-based energy development for executives and managers (2 trips, 3 persons)	No change was made to the activity; 3 trips were realized with 5 participants.
Activity 2.5: To develop technical manuals on EFD using gamal, kaliandra and lamtoro	No change was made to the activity; it had been fully realized as planned.

Output 3: Investment in wood-based energy industry development promoted.	No change was made to originally planned output; it had been delivered as planned.
Activity 3.1: To disseminate information on technology and market for wood-based energy through website and other means.	No change was made to the activity; it had been fully implemented as planned.
Activity 3.2: To organize one national workshop on wood-based energy development in Medan.	The activity was held in Pematangsiantar City for cost efficiency reason without compromising its originally planned objectives.
Activity 3.3: To examine calorific properties of the energy wood species planted (3 species, 2 ages).	The activity was modified to include only two species aging 30 and 36 months due to the failing lamtoro to survive older than 24 months.
Activity 3.4: To conduct studies on feasibility of investment in commercial manufacturing of wood-based energy including electricity and wood pellet.	The activity implemented was reduced to only study on feasibility of investment in wood pellet industry, which was fully realized.
Activity 3.5: To review existing policy on wood-based biomass energy development.	No change was made to the activity; it had been fully executed as originally planned.
Activity 3.6: To form and operate a consultation forum on renewable energy for enhancing communication and coordination between stakeholders.	No change was made to the activity; it had been fully implemented as it was planned.

Three unplanned activities had been implemented using unspent funds of the project with the prior approval of ITTO during the reporting period in October – December 2021 as highlighted below:

- To support forest farmers groups (KTHs) on initiating development of an agro-forestry livelihood project. Under the project, gamal and kaliandra will be grown in combination with quick yielding coffee species and bee raising for honey production. The expected outputs are bee honey (short run), coffee beans (mid-term) and energy wood (mid to long run).
- To undertake the final maintenance and growth monitoring of the demonstration plantations. The activity includes weeding, application of pesticide as needed and fertilizer as well as monitoring of performance of the plantations.
- To demonstrate on the use of the technical manuals for growing energy wood species (gamal, kaliandra and lamtoro) developed under Activity 2.5 of the project. The activity was meant to ensure that FMUs and farmers are able to properly use the technical manuals on the ground.

3.2. Time Schedule

- The project actually commenced in October 2017
- Planned duration of the project was 48 months; all planned activities were completed within the sanctioned time, i.e. from October 2017 to September 2021
- In accordance with the project agreement, the Executing Agency was to submit a completion report and relevant technical reports by end of December 2021 and a final financial audit report by end of January 2022 at the latest.

3.3. Inputs Applied

a. Manpower

i. Project key personnel

The key personnel employed by the project with the expressed approval of ITTO were:

- Project Coordinator : Mr. Jimmy Chandra, ISWA
- Project Secretary & finance : Ms. Richma Wahyuni, ISWA
- Technician : Mr. Edi Setiarahman, ISWA
- Field Supervisor : Mr. Dedi Agape / Mr. Alamsyah

In addition, a professional project management advisor was also hired by the project at the request and financial burden of ISWA as the collaborating/implementing agency.

Director of UHP, i.e. Mr. Istanto and 5 staffs had been appointed by DG PHPL through the Executive decision of the Director General number SK.72/PHPL/SET/KUM.3/9/2017 as the supervisory body of the project.

ii. National Consultant

Nine (9) National Consultants had been employed by the project with the prior expressed approval of the ITTO to assist in the execution of Activities 1.1; 1.2; 1.4; 1.5; 2.5; 3.4; 3.5 and 3.6

iii. Contractors

Local contractors had been employed by the project which consisted of:

- CV. Rio, UD. Tunas Rimba & CV. Anggi Activity 1.3,
- UD. Tunas Rimba & CV Bumi Hijau Activity 2.2
- University of Simalungun Activity 2.1
- EFORDIA Laboratory Activity 3.3
- Koperasi Makmur Mandiri Activity 2.3

b. Expenditures

Realized expenditures as of 30 September 2021 were as follows:

- Total amount of funds received by ISWA : USD 487,100
- Total funds expended : USD 447,147
- Unspent funds retained by ISWA : USD 39,953
- Undisbursed funds : NIL

Financial audit reports on the fiscal years 2018, 2019, 2020 had been timely submitted to ITTO and endorsed; above figures were based on the accounting of funds by the PMU. The exact figures would be known after the final statements had been produced by the financial auditor. The audit report covering the entire project duration was planned for submission by end of January 2022.

c. Sectoral policy and program

By implementing the different activities, the project had contributed to sectoral policy and program in one form or another as highlighted below:

- During the implementation of the dialogues with local communities at 49 villages, the objective of the project to initiate EFD program was enthusiastically responded by farmers knowing that market for energy wood planted will be made available by private investor.
- The training on skills for EFD had encouraged the FMUs to get involved in the supply of energy wood to wood pellet industries in cooperation with local communities.
- The technical manuals on EFD using gamal, kaliandra and lamtoro would ease the task of FMUs and local communities in realizing energy forest plantations development.

- During the occasion of the FGD on feasibility of investment in wood pellet industries, a few forests industry companies had expressed interest in making investment but with no realization as to date due to plummeting wood pellet markets.
- During the occasion of FGD on reviewing policy on wood-based energy development, many observers and practitioners had encouraged the government to enhance existing policy for purpose of accelerating EFD process.

d. Physical environment
   - In terms of physical environment, during the 4-year period, the project had created an environment wherein the primary beneficiaries, i.e. local communities, FMUs and private sector had been made aware of the potential benefits of energy forest development (EFD) program.
   - The project had established 33 Ha of energy forest models at 3 sites that served as the demonstration and training sites for local farmers; it demonstrated the fact that energy forests can be successfully established.
   - Under the project, 205 community leaders in total had been trained on different skills relating to wood-based energy development and also on production of bee honey and management of village cooperatives.

4. Project Outcome and Involvement of Target Beneficiaries

4.1. Achievement of the Specific Objective

To what extent the specific objective had been achieved? It had to be assessed using the achievement indicators defined in the LFM of the project document; defined indicators of the specific objective were:

i) Approximately 36 Ha of energy forest established and used for demonstration and training.

- 33 Ha of energy forest had been established at 3 FMUs: 9 Ha at Simalungun FMU, 12 Ha at Humbang - Hasundutan FMU, and 12 Ha at Tapanuli Selatan FMU. The PMU was able to locate only 9 Ha of suitable lands at Simalungun FMU mainly for reson of accessibility and compactness of the land. In other words, achievement of the indicator was only 91.67%.
- The species used in establishing the demonstration energy forests were gamal, kaliandra and lamtoro, the same species as planned ones.
- The energy forests had been used as intended to, i.e. for purpose of demonstration and training.

Training on planting of seedlings at Simalungun, (Photo by PMU)

ii) At least 100 farmer leaders trained on skills for EFD and 50 leaders on community cooperative management

- 205 farmer leaders had been trained on skills for EFD covering nursery, land preparation, planting, maintenance and harvesting. In addition, 35 farmer leaders were also trained on

skills for the production of bee honey as an incentive for villagers to participate in the EFD program. Hence, the indicator was over-achieved.

- On cooperative management, 35 farmer leaders were trained, only 70% of the planned number. It was due to the strict enforcement of covid19 control protocols exercised by the local governments. During the pandemic time, it was prohibited to assemble large number of people in one room. The maximum number that could be assembled were 40 people which comprised 35 farmer leaders and 5 training organizers/trainers.

Classroom lecturing on cooperative management (Photo by PMU)

iii) 2-3 companies indicated interest in making investment on wood-based energy industry. Indeed, during the FGD on feasibility study on investment in wood-based energy held in Jakarta in September 2019, a few ISWA member companies had indicated interest in the wood-based energy business. In addition, a South Korea-based energy company had also expressed interest in the wood pellet investment. However, none of those companies had made decision to invest till completion date of the project by 30 September 2021. In other words, this particular indicator was not satisfied by the project, which was due mainly to the plummeting price of wood pellet.

Workshop on feasibility study on investment of wood-based energy (Photos by PMU)

Above matching of defined indicators of the specific objective with the project outcomes clearly indicated that the specific objective was only partially achieved due mainly to the forces beyond the control of the PMU, i.e. the disaster on working condition created by covid19 pandemic and the plummeting price of wood pellet in international markets.

It was also hypothesized during the project formulation stage that delivery of planned outputs would realize the specific objective. It was, therefore, necessary to assess to what extent individual outputs had been actually delivered. To this end, outcomes of individual activities under each output shall be assessed against defined indicators of the respective outputs, which are presented below:

Output 1: Development of sustainable supply of energy wood initiated

Defined indicators of the output were:

i. Available suitable lands for EFD in North Sumatera province identified and mapped in Year 1.
ii. Suitable lands for development of energy forest models in 3 FMUs identified and mapped in Year 1 (revised indicator at the approval of the PSC).
iii. 36 Ha of energy forests established using 3 species at 3 sites in Years 1-2
iv. Estimates of sustainable energy wood supply planted on degraded lands available in Year 4
v. Potential supply of energy wood from non-forest sources assessed in Year 3

The matching of above indicators with the outcomes of individual activities implemented under Output 1 was thoroughly analysed in Section 4.3 of the Final technical report No. 1 (FTR 1) with the following conclusions:

a. The first indicator was satisfied as available suitable lands for energy forest development had been identified and mapped under Activity 1.1;
b. The second indicator was met as available suitable lands for energy forest plantations had been identified and mapped in 3 FMUs under Activity 1.2;
c. The third indicator was nearly satisfied as 33 ha of energy forest model had been established under Activity 1.3 or 3 ha short of the target;
d. The fourth indicator was fully satisfied as estimates of sustainable supply of energy wood planted on degraded lands were produced under Activity 1.4; and
e. The fifth indicator was satisfied as figures on potential supply of energy wood from non-forest sources had been generated under Activity 1.5.

Above conclusions clearly indicated that Output 1 had been fully delivered noting that only one indicator that was not completely satisfied.

Land clearing at Simalungun and Humbang Hasundutan FMUs (Photos by PMU)

Output 2: Skilful manpower for development of wood-based biomass energy available

Defined indicators of the output were:

i. Dialogue with local communities of 50 villages in 13 districts conducted; number of districts reduced from 25 to only 13 for technical reasons approved by the PSC
ii. 100 farmer leaders trained on EFD techniques
iii. 50 farmer leaders trained on community cooperative management
iv. 2 comparative studies on wood-based energy development conducted
v. 3 technical manuals on EFD using gamal, kaliandra and lamtoro species formulated

The matching of above indicators with the outcomes of individual activities implemented under Output 2 was deeply assessed in Section 4.1 of the Final Technical Report No. 2. With the following conclusions:

a. The first indicator was nearly met as dialogues had been conducted at 49 villages under Activity 2.1;
b. The second indicator was fully satisfied as 205 farmer leaders were trained on EFP development techniques under Activity 2.2;
c. The third indicators was met only 70% of the target under Activity 2.3 due mainly to the enforcement of health protocols on covid19 pandemic control;
d. The fourth indicator was fully met as 3 comparative studies with 6 participants were realized under Activity 2.4; and
e. The fifth indicator was fully satisfied as 3 technical manuals on growing gamal, kaliandra and lamtoro had been developed and ready for distribution.

Above conclusions justify an overall conclusion that Output 2 had been delivered noting that one indicator was only 98% met, one indicator was only 70% satisfied but two indicators were met above the targets.


Training on setting up temporary nursery at Simalungun FMU and dialog sessions at Tapanuli Utara District (Photos by PMU)

Output 3: Investment in wood-based energy industry development promoted

Defined indicators of the output were:

i. Website of wood-based energy operational since Year 1.
ii. One national workshop on wood-based energy development organized in Pematangsiantar City in Year 1 (the venue was moved from Medan for cost efficiency reason).
iii. Data on calorific properties of gamal, kaliandra and lamtoro planted at 3 FMUs available in Year 4.
iv. Feasibility study on investment in wood pellet industry conducted in Year 2 (moved from Year 4 at the request of the PSC).
v. Existing policy on wood-based energy development reviewed.
vi. A stakeholder consultation forum operational since Year 2.

The matching of above indicators with the outcomes of the individual activities implemented under Output 3 was thoroughly analyzed in Section 4.1 of the Final Technical Report number 3 with the following conclusions:

a. The first indicator was fully satisfied as the project website had been in operation since Year 1 under Activity 3.1;

b. The second indicator was fully met as the workshop had been organized in Year 1 under Activity 3.2;
c. The third indicator was satisfied as calorific properties of gamal and kalindra aging 30 and 36 months grown at two different sites were finally generated under Activity 3.3;
d. The fourth indicator was met as the feasibility study was completed in Year 2 under Activity 3.4;
e. The fifth indicator was fully met as existing policy on wood-based energy development was reviewed involving stakeholders under Activity 3.5; and
f. The sixth indicator was met as the stakeholder forum on wood-based energy development was established in Year 2 under Activity 3.6.

Above conclusions clearly indicated that Output 3 had been delivered noting that one indicator was only partially met due a force majeure situation.

If so, it is reasonable to conclude at this juncture that, based on delivery level of individual outputs as summarized above, the specific objective of the project had only been partially achieved which confirmed the conclusion made on the basis of matching the outcome indicators defined in the LFM with results of project interventions. Above conclusions also accept the hypothesis made by the proponent that full delivery of outputs would fully realize the specific objective; likewise, partial delivery of outputs would result in a partial achievement of the specific objective.


FGD on review of existing policy on wood-based biomass energy development (Photos by PMU)

4.2. Prevailing Situations at Commencement and Completion of the Project

a. Tangible results

The tangible results of individual project activities under each output which did not exist prior to implementing the project are listed below:

Output 1: Development of sustainable supply of energy wood initiated

- Information on extent and distribution of suitable lands for EFD in North Sumatera province including their maps.
- Information on extent and location of state forest lands suitable for planting of gamal, kaliandra and lamtoro species in 3 FMUs, namely: Simalungun, Humbang Hasundutan and Tapanuli Selatan.
- A total of 33 hectares of energy forest of gamal, kaliandra and lamtoro species established 9 Ha, 12 Ha and 12 Ha at Simalungun FMU, Humbang Hasundutan FMU and Tapanuli Selatan FMU, respectively.

- Estimates of potential sustainable supply of energy wood from planted energy forests in 13 districts of North Sumatera province.
- Estimates of potential supply of energy wood from non-forest sources, mainly rubber and palm oil wood.
- Short videos and photos on different project activities.


Palm oil and rubber plantation in Simalungun district (Photos by PMU)

Output 2: Skilful manpower for development of wood-based biomass energy available

- Information on real response of farmers at 49 villages in 13 districts (kabupaten) in North Sumatera province to expressed intention of the project to initiate EFD on unproductive state forest lands.
- Trained farmers on EFD skills, 205 community leaders in total.
- Trained community leaders, 35 people in total, on village cooperative management.
- Enriched experience of 5 forest executives and managers in wood-based energy development through overseas comparative studies.
- Technical manuals for growing gamal,kaliandra and lamtoro as the source of raw material for production of wood-based energy.
- Short videos and photos on different project activities

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

Output 3: Investment in wood-based energy industry development promoted

- A website on energy operated by ISWA where the relevant information on wood biomass energy generated under the project or other sources is stored.
- Well informed stakeholders of the objectives of the project who were the participants of the national workshop on wood-based biomass energy development held in Pematangsiantar City on 4 November 2017 attended by some 53 stakeholders.
- Accurate information on calorific properties of gamal and kaliandra wood species aging 30 and 36 months planted on two different sites.
- Feasibility of investment in wood pellet industry if constructed at two different sites in North Sumatera Province.
- Result of review on existing policies on wood-based energy development: weaknesses and enhancing measures.
- A stakeholder forum on wood-based energy development at FMU level.
- Short videos and photos on different project activities.

b. Sectoral policy and program

By implementing particular activities, the project has, in fact, contributed to sectoral program in one form or another as highlighted below:

- Findings of Activity 1.1 would be useful for NSPFA in EFP development planning;
- The information generated under Activities 1.4 and 1.5 could be used in forest industry development planning, and;
- Findings of Activity 2.1indicated level of dependence to forest resources for livelihood of local communities thus useful for community welfare development planning.

c. Physical environment

As regards physical environment, during the 48-month of project operations, the project had created an environment wherein villagers are now aware of the potential benefits of EFP development, and policy makers had come to recognize weaknesses of existing policy on wood-based energy development, and at the same time acknowledge the great potential contribution of the forest sector to share of renewable energy in national energy mix.

As regards the problem with “clear and clean” status of state production forest lands, it requires strong commitment of the government at all levels and local communities to collaboratively define a win-win solution that benefits stakeholders in the interest of sustainable forest management.

4.3. Involvement of the Target Beneficiaries

The primary beneficiaries of the project were: the North Sumatera Provincial Forestry Agency (NSPFA) including the FMUs under its administration, the district governments, local communities and private sector. These beneficiaries had involved in the project operations in one form or another as highlighted below:

a. The NSPFA and FMUs

- The NSPFA had acted as the co-organizer of the national workshop on wood-based energy development held at Horison Hotel in Pematangsiantar City on 4 November 2017. More importantly, the NSPFA had encouraged the FMUs to support implementation of the project as necessary and as appropriate.
- The FMUs of Simalungun, Humbang Hasundutan and Tapanuli Selatan had actively involved in the establishment of the energy forest models for purpose of demonstration and

training sites since the site identification, site preparation, planting operation, training on skills for energy forest development (EFD), etc.

- The NSPFA and FMUs were also active in providing data and information on degraded forest lands requested by the Consultant on Activities 1.1 and 1.2.

National workshop on wood-based energy development held in Pematangsiantar city (Photos by PMU)

b. The local government

- 13 district governments had supported the arrangements of the dialogues between the project and local communities on potential long-run benefits of EFD program accruable to local economies (Activity 2.1), in implementation of training modules on EFD (Activity 2.2) and on the training on village cooperative management (Activity 2.3).

Dialogue session at Simalungun and Humbang Hasundutan FMUs (Photos by PMU)

- The district government of Tapanuli Utara had taken part in the comparative study on wood-based energy development to Vietnam under Activity 2.4.
- The district governments of Simalungun, Humbang Hasundutan and Tapanuli Selatan were also involved in the formation process of stakeholder forum on wood-based energy development (Activity 3.6) while Simalungun district government was involved in the FGD on feasibility of investment in wood pellet industry under Activity 3.4.

c. Local communities

- Local communities residing nearby the energy forest models were actively involved in the forest model establishment operations (Activity 1.3);
- Local communities of 49 villages in 13 districts (kabupaten) were involved in the dialogue sessions with the project (Activity 2.1). In addition, local communities had also served as the trainees of the training on skills for EFD, including training on skills for bee honey production (Activity 2.2).

Training on skills for bee honey production (Photo by PMU)

- Local community leaders had also involved in the training on village cooperative management as the trainees (Activity 2.3) and in field collection of data on potential supply of energy wood from non-forest sources (Activity 1.5).
- Local community representatives were also involved in the national workshop on wood-based energy development (Activity 3.2) and in the formation process of stakeholder forum on wood-based energy at the FMU level (Activity 3.6).

d. Private sector

- A number of ISWA member companies took part in the FGD on feasibility of investment in wood pellet industry under Activity 3.4 and in the formation process of stakeholder forum on wood-based energy under Activity 3.6.
- Four small local firms were appointed as the executor of Activities 1.3 and 2.2 under the sub-contract system applicable to ITTO projects.
- The University of Simalungun was the leading consultant in the implementation of dialogue under Activity 2.1.
- The Koperasi Makmur Mandiri was appointed as the executor of the training on village cooperative management under Activity 2.3.

Most of all, the primary beneficiaries were also represented in the PSC and invited to the PSC meeting as necessary and as appropriate due mainly to financing limitation.

Workshop on feasibility of investment in wood pellet industry and training on cooperative management (Photos by PMU)

4.4. Sustainability of The Project

Sustainability of the project after its completion is expected to prevail by the favourable conditions that had been developed under the project including:

FGD on review existing policy on wood-based energy development (Photo by PMU)

- The growing interest of stakeholders in joining the EFD program initiated by the project;
- Availability of skilful farmers for EFD and technical manuals for growing energy wood species, namely gamal, kaliandra and lamtoro;
- Realized investment in wood pellet industry that would secure market for energy wood produced under the EFD program;
- Enhanced national policy on wood-based energy development; and Developing wood processing technologies for diversified utilization of energy wood.
- The growing interest of local governments in wood-based energy development sparked by the benefits of EFP development accruable to local livelihood and economies.

5. Assessment and Analyses

5.1. Project Rationale and Identification Process

a. Project Rationale and Identification Process

- The information on national energy market released by the MoEMR of Indonesia back in early 2014 revealed several problems facing the market which included:i) the evergrowing consumption of energy and sluggish development of supply capacity, ii) high dependence of supply on fossil energy despite its limited reserve, iii) growing government subsidy on energy overtime, iv) sub-optional utilization of renewable energies and weak nergy consumption program, and v) weak mitigation of climate change relating to energy production and consumption processes.
- In its efforts to overcome the problems, the MoEMR decided to implement policies on both the demand and supply sides of the energy market. On the demand side, the policy centered on improving efficiency in energy utilization from up-stream to down-stream, i.e. industrial household, transportation and commercial sector; on the supply side, the policy focused on increasing the share of new renewable energy in national mix from the current 7 percent to 23 percent by year 2025.
- The project proponent argued that the forest sector of Indonesia has a great potential to contribute to achieving the targeted national energy supply through generation of wood-based biomass energy using available forest resources. This project aimed to increase the contribution of the forest sector to renewable energy supply and regional economic development through increased supply of wood-based biomass energy.
- To this end, the key problem addressed by the project was “weak enabling conditions for building up supply capacity of wood-based biomass energy in North Sumatera Province”. Unless this problem was resolved, the project proponent argued, it would be impossible to build up supply capacity of wood-based biomass energy in the region. Consequently, the specific objective of the project was “to improve enabling conditions for building up capacity

to supply wood-based biomass energy in North Sumatera region". The enabling conditions were defined as sustainable supply of energy wood as the raw material of biomass energy, skilful manpower for wood-based biomass energy development and capital investment for wood-based biomass energy development.

5.2. The Problem Addressed, Project Design and Implementation Strategy

- The key problem addressed by the project was the weak enabling conditions for building up supply capacity of wood-based biomass energy in North Sumatera Province. The underlying notion of selecting the key problem was that supply capacity of wood-based biomass energy would be very difficult to increase if the enabling conditions remained weak.
- The key problem identified was then thoroughly analyzed involving the primary stakeholders using the problem tree technique promoted by the ITTO. The analysis identified the consequences, direct causes and indirect causes of the key problem which facilitated deep understanding on the cause-effect relationship of the key problem and allowed for defining the relevant and effective solutions to the problems.
- The cause-effect relationship was summarized in the problem tree while means-end or project interventions were pictured in the solution tree which was constructed simply by inverting the problem tree. Consistent with the problem tree and solution tree, the relevant and effective project design was defined as follows:

  Development objective:
  To increase contribution of the forest sector to renewable energy supply and regional economic development through increased supply of wood-based biomass energy.

  Specific objective:
  To improve enabling conditions for building up capacity to supply wood-based biomass energy in North Sumatera region

  Outputs
  Output 1: Development of sustainable supply of energy wood initiated
  Output 2: Skilful manpower for development of wood-based biomass energy available
  Output 3: investment in wood-based energy development promoted

  Activities
  In total, sixteen (16) relevant project activities were identified: 5 activities under Output 1; 5 activities under Output 2 and 6 activities under Output 3. Each of the activities was defined correspond to the 16 sub-causes of the 3 main causes of the key problem. There were 5 sub-causes of the first main cause, 5 sub-causes of the second main causes and six sub-causes of the third main cause of the key problem. The 3 outputs were defined correspond to the 3 main causes of the key problem.

The implementation strategy pursued consisted of seven elements, namely:

i. Securing long-term supply of energy wood
   - To ensure quantity and quality of energy wood it was decided to grow fast-growing energy wood species with high calorific content such as gamal, kaliandra and lamtoro.
   - In addition to growing energy wood, other potential sources of energy wood were rubber and palm oil plantations that were available in sizable areas in North Sumatera region

ii. Selecting most promising energy tree species

Based on growing site requirements and available information on growth and yield as well as calorific properties, the species selected for promotion were: gamal, (*Gliricida sepium*), kaliandra (*Calliandra callothyrsus*) and lamtoro (*Leucaena leucocephala*).

iii. Training of manpower
- Currently, skilful manpower for wood-based energy development was scarce that training was an essential work program of the project.
- The training should have covered the entire value chains of wood-based energy development, but the value chains covered were only of energy wood supply.

iv. Promoting investment
- Wood-based energy supply can only be built up if private sector was interested in making investment.
- Therefore, promoting investment was an essential component of the project.

v. Establishing a stakeholder consultation forum (SCF)
- A SCF was needed to facilitate continuous exchange of experience and information amongst stakeholders, notably government authorities, private firms and local communities

vi. Internal monitoring
- Adequate monitoring of progress in implementation was exercised by appointing a field supervisor that was responsible for supervising the day-to-day project operations.
- Appropriate inputs to individual activities had been made timely available in terms of quantity and quality.

vii. Collaborating
- The project activities were implemented collaboratively involving partners of different background.
- Selection of partners was made on the basis of needed competence.

5.3. Critical Differences between Planned and Actual Implementation

A number of deviations to the originally planned activities occurred due to various reasons as listed below:

i. Activity 1.2: To formally allocate lands for EFD on existing land use plan. Upon retrospect, this activity was difficult or even impossible to realize; to change existing land use of the province would require considerable resources, especially time and efforts, due to complicated bureaucratic processes. At the approval of the PSC, Activity 1.2 was redefined as “To identify suitable lands for establishing energy forest models in three FMUs using gamal, kaliandra and lamtoro for purpose of demonstration and training”. This newly defined activity was fully completed during YPO 1 just as planned.

Land clearing at Tapanuli Selatan (Photo by PMU)

ii. Activity 2.2: To train local communities on technical skills for EFD covering planting, tree nursing and harvesting techniques. The PMU considered this activity as incomplete for missing an essential element of training. At the approval of the PSC, the activity was redefined as “To train local communities on technical skills for EFD covering nursery, planting, tree nursing and harvesting techniques”. The targeted outcome stayed at 100 farmer leaders of 50 villages. A training module on bee honey production techniques was also added to the activity at the strong request of local communities and endorsement of the PSC.

Training on harvesting technique (Photo by PMU)

iii. Activity 3.2: To organize one national workshop on wood-based energy development in Medan. At the approval of the PSC, the venue was moved from Medan to Pematangsiantar City purely for cost efficiency reason.

iv. Activity 3.4: To conduct studies on feasibility of investment in commercial manufacturing of wood-based energy including electricity and wood pellets. The activity was originally planned for execution under YPO 4. At the request of the PSC, the execution was advanced to YPO 2 in order to provide ample time to widely disseminate the feasibility report.

v. Budget revision
With the escalating domestic duty travels and significant deviations in spending during the October 2017 – Sept 2021, reallocation of budget between components was made twice with the approval of the ITTO Secretariat in order to ensure procurement of needed inputs to execution of activities in accordance with existing ITTO financial rules and procedures.

5.4. Adequacy of Project Inputs

In terms of manpower, project inputs could be judged as adequate. Appointed project key personnel and the national expert on operational management, called management advisor, had been able to properly handle the overall operational management of the project. The national consultants and local contractors hired were generally able to accomplish the assigned tasks satisfactorily within the sanctioned time and financial budget.

It is worth mentioning the decease of the first field supervisor employed by the project with the prior expressed consent of the ITTO Secretariat, Mr. Arnidin Alamsyah; the gentleman died of heart and kidney problems. He had contributed a great deal to the project especially on the establishment of the energy forest models since the very beginning. He was then, replaced by Mr. Dedi Agape Sitanggang with the official appointment by the ITTO.

In terms of funding, the sanctioned budget was sufficient to fully finance the entire project operations. No problem had ever occurred with respect to financing of activities or purchasing of capital items as well as other needed materials. The project funds were always timely disbursed by ITTO to ISWA on behalf of the Executing Agency in 5 instalments. The planned GOI's contribution was somewhat under-spent which could only reach USD 117,350 in total by end of the project.

Disbursed ITTO funds had been used in accordance with the provisions of the project agreement. Appropriateness of expenditures had been duly audited by an independent, registered public accountant and reported to ITTO by end of every fiscal year and by end of the project. Indeed, proper use of previously disbursed funds was the prerequisite to realizing the present instalment of funds by ITTO.

5.5. External Influences

The key assumptions made regarding implementation of the project were generally valid throughout the project operations. The local communities were cooperative and enthusiastically participated in the dialogues with the project, in the establishment of the energy forest models, in different training programs and in the discussions held by the consultants on different subjects.

Dialogue between local government and communities (Photo by PMU)

The provincial and local governments had been supportive throughout the project implementation process; they were actively involved in the establishment of energy forest models at three FMUs, the NSPFA was heavily involved in the national workshop on wood-based energy development, the district governments were actively involved in the arrangements of the dialogues between the project and local communities, in the FGDs on reviewing policies on wood-based energy and also in forming the stakeholder consultation forum (SCF).

The private firms were actively involved in different project activities including in the national workshop, in the FGDs on policy review, SCF formation and on review of the feasibility study on investment in wood pellet industries.

The assumption made were valid throughout the project duration. However, the planned mitigating measures on promotion of investment proved not working as no investment in wood-based energy development had been realized till end of the project.

5.6. Project Beneficiaries

The primary beneficiaries of the project were local communities, regional and local governments as well as private sector. Involvement of these beneficiaries in the project implementation had been discussed in Section 4.3 above.

The primary beneficiaries had gained different benefits from the project in one way or another. The local communities were paid wages for their service in the forest model establishment, obtained skills through the training on EFD and on village cooperative management and received some honoraria for their participation in the dialogue sessions.

The regional and local governments had benefited mainly through the myriad information generated by the project and information on availability of suitable lands for EFD useful for regional development planning.

The private firms or parties and consultants had benefited from their expertise in the implementation of training on EFD techniques, in the execution of Activities 1.1; 1.2; 1.3; 1.4; 1.5; 2.1; 2.2; 2.3; 2.5; 3.4; 3.5 and 3.6 and also from the information on market and technology for wood-based energy development.

Project advisor, Dr. Hiras Sidabutar introduced EFD to the local communities (Photo by PMU)

5.7. Project Sustainability

The prospect for sustainability of the project is excellent under one condition: that investment in energy wood processing is realized. If this were true, market for the energy wood planted by local communities and FMUs on degraded lands would be secured; secured market would serve as a strong incentive for local stakeholders to get involved in and support wood-biomass energy development.

If market for energy wood were secured, local economies would be growing; small local firms and village cooperatives would be carrying out different activities relating to EFD including planting, harvesting, hauling, etc. Also private firms and cooperatives would be gaining economic incomes from their engagement in energy wood processing activities. It is obvious that security of market for

energy wood and for processed energy wood such as chip wood and wood pellet is key to sustainability of the project; and market can be secured only if investment in wood-based energy development is realized. The government is urged to play role in realizing the needed investment in energy wood production and utilization, not only for profit reason but also for social and environmental benefits accruable to North Sumatera region.

5.8. The Institutions Involved in the Project Implementation

Listed below are the institutions that were involved in the project implementation:

- The Aek Nauli FRI was involved in the execution of Activities 1.1; 1.2; 1.4 and 1.5 through its experienced expert, Dr. Aswandi.
- The EFORDIA in Bogor was involved in the analyses of calorific properties of planted energy wood at its laboratory, and in the execution of Activities 3.5 and 3.6 through its competent expert Dr. Subarudi.
- The NSPFA was involved in the organization of the national workshop on wood-based energy development held at Horison Hotel in Pematangsiantar City.
- CV Anggi, CV. Rio, CV. Bumi hijau and UD. Tunas Rimba, four small local firms, were appointed as the executors of Activities 1.3 and 2.2
- University of Simalungun in Pematangsiantar City was appointed to lead the execution of Activity 2.1
- Koperasi Maju Bersama was appointed to assist in the implementation of Activity 2.3
- IPB University was assigned by the project to conduct the feasibility study on investment in wood-based energy development, in wood pellet industry in particular.
- Directorate of Production Forest Development of the Directorate General of Sustainable Production Forest Management (PHPL) served as the executing agency of the project
- The Indonesian Sawmill and Woodworking Association (ISWA) was involved as the collaborating agency and at the same time as the implementing unit of the project based on the MOU signed by both DG PHPL and ISWA.

6. Lessons Learned

6.1. Project Identification and Design

- The key problem addressed by the project had a strong rationale as it was based on observed, real problems surrounding the national energy market of Indonesia which was closely linked with the too low share of renewable energy in the national energy mix; the key problem identified was affirmed by the primary stakeholders;
- The key problem identified was thoroughly analysed involving representatives of the stakeholders to fully understand its cause-effect relationship by identifying the consequences as well as the direct and indirect causes of the key problem;
- The clear cause-effect relationship had facilitated construction of a sound project design with a strong vertical logic, relevant elements and well defined interventions;
- The sound project design had eased the operational planning and facilitated the smooth implementation with only minor adjustments to planned activities;
- The variations between planned and actual implementation were minor in nature which included underestimate of complication in revising developed land use plan, the missing nursery module from the training component, the moving of national workshop venue from Medan City to Pematangsiantar City and advancing implementation of feasibility study from YPO 4 to YPO 2; and
- Project planners should attempt to distinguish between conceptual or normative achievement with factual or real achievement when defining SMART indicators of outputs and objectives in order to minimize time lapse between the two forms of achievement.

6.2. Project Implementation

- The executing agency of the project was the Directorate of Production Forest Development of Directorate General of Sustainable Production Forest Management that mandated ISWA to fully implement the project based on a MOU signed by both parties establishing roles and

responsibilities of each in a clear manner which had avoided any confusion during the course of project implementation;

- The small PMU under ISWA, comprised only four key personal, was proved able to properly manage project operations and could easily adapt to changing project environments;
- The key success factors of the project were primarily the strong leadership of the Project Coordinator, his good working relation with internal as well as external partners, with the executing agency and FMUs in particular;
- Continued communication and coordination between the PMU and the ITTO Secretariat had significantly contributed to overcoming different operational issues and speeding up the pace of operation;
- The high compliance of the PMU to rules and procedures applying to ITTO projects as well as to the project agreement had facilitated completion of the project within the sanctioned time and funds;
- The strategy pursued in implementing the project was consistent with the project elements specified and operationalized in a collaborative manner by working closely with the project beneficiaries, relevant institutions and competent partners; the strategy proved effective in achieving the project objectives;
- The supportive government authorities and cooperative local communities had simplified and eased the full execution of planned project activities; and
- The original indicators of achievement defined in the LFM was exclusively based on the project design constructed during the project formulation stage; appropriateness of the indicators as a tool for measuring achievement was regularly evaluated during the course of project implementation and adjustments made as necessary based on actual progress in implementation.

7. Conclusions and Recommendations

7.1. Conclusions

i. The key problem addressed was in conformity to the actual problems surrounding the national market of energy in Indonesia which was defined as “weak enabling conditions for building up supply capacity of wood-based biomass energy in North Sumatera region”.

ii. The key problem addressed was adequately analysed, its main causes and sub-causes as well as consequences were clearly specified. The project design was developed based on a clear and logical cause-effect relationship that its vertical logic was strong and its elements were consistent with the problems to be resolved;

iii. The roles and responsibility of the Executing Agency, Directorate of Production Forest Development (UHP of DG PHPL) and ISWA as the collaborating agency and implementing unit of the Project were clearly defined in the MOU duly signed by both parties which had avoided any confusion during the course of project implementation;

iv. The project had been smoothly implemented and successfully completed, which were made possible by, among others: the sound project design, the effective and appropriate implementation strategy pursued, the adequate resources in terms of time, funds and manpower, the strong support of the primary beneficiaries, the able PMU and the continued support accorded by the ITTO Secretariat;

v. The project operations were managed by a small PMU comprising the project coordinator, a secretary, a technician, a field supervisor and a management advisor that proved able to complete the project within the sanctioned financial and time budget;

vi. The specific objective defined was nearly achieved through the full execution of sixteen planned activities pertaining to three outputs, noting that no investment was realized in wood pellet industry during the project duration;

vii. The assumptions made were valid throughout the project duration and the risk mitigating measures employed were effective in preventing risks from occurring; and

viii. The indicators of achievement originally defined had been revisited at the beginnings of the current years of operations, and necessary adjustment made based on progress in implementation to ensure applicability of the indicators as the tool for measuring project achievements.

7.2. Recommendations

i. It is strongly recommended for any proponent of ITTO project to always perform an adequate analysis of the key problem addressed, in accordance with existing ITTO manual for project formulation, to ensure a deep comprehension of the cause-effect relationship of the key problem;

ii. To be sound, a project design must be built on a clear cause-effect relationship to ensure relevance and effectiveness of planned interventions to resolve the problems at hand and achieve the planned specific objective effectively;

iii. To ensure a smooth and successful completion of a project, the enabling conditions that must be prevailing include: an adaptive project implementation strategy, an able PMU, sufficient financial resource, healthy communication and strong coordination between the PMU with internal as well as external partners;

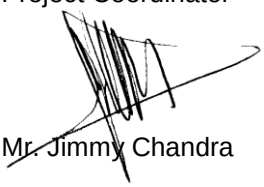
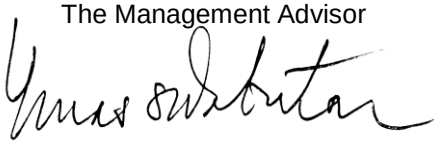
iv. It is best to employ a small but able PMU in order to minimize overhead costs, ensure effective coordination with partners and maximize adaptability to changing environment;

v. To ensure quality of project outcomes and deliverables, selection of consultants, experts, contractors and professionals to employ must be strictly based on experience, expertise and competence;

vi. The executing and collaborating agencies are strongly advisable to follow up the outputs and findings of the project in order to sustain the project; the agencies are also urged to find ways through their network and influence to realize the investment in energy wood production and utilization in order to secure market for energy wood and promote local economies;

vii. The potential risks associated with the project implementation should be defined correspond to the key assumptions made; relevant risk mitigating measures identified during the project formulation stage must be exercised and modified as necessary during the course of project implementation.

Responsible for the Report

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

Date: December 2021

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